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"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted: and it will die away, if they shall entirely cease."—

Sir Wm. Jones.

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No. IV. 1860.

Is the Pushto a Semitic Language?—By the Rev. ISIDOR LOEWENTHAL, *Peshawur.*

Error is immortal. The old fable concerning Hercules and the Hydra has doubtlessly a typical reference to the quixotic bouts men sometimes undertake against error; only seven heads is too small a number to typify the vitality of a good blunder, the longevity of a plain definite mistake. The fable, too, makes Hercules victorious; but who has ever seen the successful gardener that has really extirpated a weed which once has taken root in his grounds? This ineradicability may be predicated of any error, but necessarily most so of such as appear to rest on the authority of a great name, and are brought forward now and then by those who have in some way or another acquired the reputation of being authorities. This is very provoking. Is it really so that men love darkness rather than light?

More than seventy years ago the first President of the Asiatic Society of Bengal happened to state that the Pushto language had a manifest resemblance to the Chaldaic. There is evidence in the earlier volumes of the "Asiatic Researches" that some attention was paid in Calcutta to the Pushto language in those days, but, it appears, more for literary than philologieal purposes. At all events the statement of Sir William Jones remained uncontradicted and unchallenged for many years. In Germany even the opinion gained currency through Kleuker (the earliest German translator of the Zend Avesta)

who published (Riga 1795) many of the articles of the "Asiatic Researches" in a German translation.

Klaproth, however, the distinguished traveller and orientalist, as early as 1810 vigorously attacked this opinion in the first volume of the Archives for Asiatic Literature, and dated his conviction that the Pushto is an Indo-Germanic language. In 1826, when he published his *Tableaux Historiques de l' Asie*, he held the same view.*

In 1814, Elphinstone, in his "Account of the Kingdom of Cabul" also dissented from the opinion of Sir William Jones, and stated positively that of 218 words of those in common use which he had examined, not one had "the smallest appearance of being deducible from the Hebrew or Chaldaic."

In 1829, Dorn, professor of Oriental languages at the University of Charkow, then young, but already distinguished for his attainments in Eastern Literature, in his translation of Neamet Ullah, maintained that there was not the least resemblance between Pushto and Hebrew or Chaldee. He adduces three words that had been referred to as proving a connection between them:

پلا *father*, compared with the Chaldee st. emph. אַבָּא

خستل *to take*, with the Hebrew אָחַז

رخ *the side*, with the Hebrew יָרֵךְ

He simply says that these prove nothing. And he is correct; but it may be added that the word *abá*, *abbá*, or *apá* means "father" in considerably more than thirty distinct languages (v. Buschmann, *Ueber den Naturlaut*, p. 16, which list is very far from being complete), so that such a word would have to be entirely excluded from any evidence; that the Infinitive خستل *(ákhistal)* is deceptive, the root being اخل *(ákhal)*, bearing the same relation to the Infinitive that the Persian گسل does to its Infinitive گسستن, and that it is most probably connected with the old Persian آخنس "to draw out," "take away;" whilst رخ *(arkh)* is undoubtedly the Sanskrit उरस् *(uras)* "breast;" the slight shifting of the signification finds its exact counterpart in the Sanskrit पार्श्व "the side" as compared with the Polish *piers'* "breast;" the pronunciation of the Polish *s'* is precisely

* Does Captain Raverty mean any pleasantry, when, in his Pushtoo Grammar, he "hopes the Professor will change his opinion now" twenty-five years after his death?

that of the Sanskrit श. The change of the Sanskrit ष into خ is exemplified in various languages: compare the French *savon* with Spanish *jabone* (soap); Hebrew חוג *(khúg)* and סוג (súg) "to encircle;" חָכָה *khâká*) and סָכָה (sáká) "to look;" Greek *αστηρ* with Persian اختر "a star;" Hindustani سسر with Persian خسر "*socer*;" Sanskrit *svap* with Persian خواب "sleep," etc.

Taking his materials solely from Klaproth and Elphinstone, Pott, than whom, with all his audacity, no greater etymologist has arisen, does not hesitate a moment in assigning the Pushto its place as one of the Indo-European languages. He divides the latter into five families in his *Etymologische Forschungen* (1833), and places the Persian and Pushto together into the second family, precisely as he puts the German and the Dutch together in the fourth.

In 1839, Ewald the greatest Hebraist of the present century, gave a careful examination of what materials of the language were accessible to him, and, of course, could not give the slightest support to the opinion that Pushto had any connection with a Semitic language.

The same view was clearly elucidated by Dorn again, in the transactions of the St. Petersburgh Academy of Sciences at various times from 1840 to 1845. In his Pushto Chrestomathy (St. Petersburgh, 1847), he designates the Pushto as a branch of the Indo-Persian languages.

"The Bible of Every Land," a work published by Bagster in 1848, which exhibits in its notices great accuracy and completeness of information, says of the Pushto language, "It exhibits none of the peculiarities of the Semitic dialects, but, on the contrary, forms an important link in the great Indo-European languages."

The latest edition of Brockhaus' *Conversations-Lexikon* also correctly calls the language a sister of the Persian.

And as if to clinch the matter, *Max Müller*, whose authority in such things is simply indisputable, without the shadow of a doubt ranges the Pushto among those scions of the Arian stock which struck root in the soil of Asia, before the Arian reached the shores of Europe. (Languages of the Seat of War, London, 1855.)

To these we may add minor lights to show at least the general consent of intelligent philologists, such as *Schleicher* (Zur Vergleichen den Sprachengeschichte, Bonn, 1848, p. 67,) and (Die Sprachen

Europas, Bonn, 1850, p. 130); *De Vere* (Comparative Philology, New York, 1853, p. 299); *Rapp* (Grundriss der Grammatik, Stuttgart, 1855), and others.

One might have thought the truth pretty well established by this time, were it not for the feline vitality of error, which in this instance was aided by the fact that the pure linguistic question had been mixed up with an obscure ethnological problem, which some people moreover are inclined to make somewhat of a religious question. The allusion is to the alleged claim of the Afghans to be considered children of Israel. It is not intended here to enter upon this matter. The question now is simply whether the Pushto is an Indo-European, or a Semitic language. But when Ewald, and Dorn, and Pott, and Müller have pronounced, is there any one yet who can doubt? It is mortifying to be obliged to say that there is.

When the founder of the Asiatic Society pronounced his opinion, perhaps hastily, and certainly on an imperfect inspection of scanty and perhaps faulty materials, one willingly forgets it.

Indignor, quandoque bonus dormitat Homerus!

But people must necessarily dig up old bones, *Sir George Rose* published a somewhat wild pamphlet on "The Kings of the East," in which he revives the opinion of Sir William Jones, maintains that the Pushto language does contain Hebraic elements, and blames Dr. Wolff for not finding more than one word which countenances that view.

Sir George Rose claimed neither a position as a philologist, nor an acquaintance with Pushto; hence his assertions, however strenuously made, might be allowed to rest on their own merits. But now a professed philologer enters the lists, namely, the *Rev. Charles Forster*, one of the six preachers of the Cathedral of Canterbury, Rector of Stisted, Honorary Member of the Literary Society, author of "Mahomedanism Unveiled," and of "The Historical Geography of Arabia." These facts are taken from the title page of a work designated briefly as follows: "The one primeval language traced experimentally through ancient inscriptions in alphabetic characters of lost powers from the four continents. Including the voice of Israel from the rocks of Sinai: and the vestiges of Patriarchal tradition from the monuments of Egypt, Etruria, and Southern Arabia." In

this book, as is well known, the author runs a violent tilt against men like Grotefend, Beer, Lassen, Rawlinson, St. Martin, and upsets them all to his own complete satisfaction and the reader's infinite amusement. The third volume of this work is filled up by "A New Key for the Recovery of the Lost Ten Tribes," which recovery, we are informed—and the information is at least new—is "the most interesting problem in the history of the world." It is in this that Dr. Forster reprints Jones' note from the second volume of the "Researches," and reasserts the Semitic origin of the Pushto language. In proof of this assertion he produces three words, which are to establish his position.

(1). He quotes from Wolff "אור *(or)* light, is the only Hebrew word I found in the Afghan tongue."—On this it may be observed that *or* اور in Pushto does not mean "light," but "fire," and that the word is plainly connected with the Arian tongues. In the language still called Zend "fire" is *átar*, Persian اذر; the connection of اور *(or)* with these is precisely analogous to that of the

Pushto مور (mor) *mother* with Persian مادر, Sanskrit *mátar*.
„ ورور (wror) *brother* with „ برادر Zend *brátar*.
„ لور (lor) *sickle* with „ Sanskrit *dátra*.*
„ نور (nor) *other* with „ Zend (à) *ntar*.

It may be observed that in Irish *ur* is "fire," but the connection of the latter is more likely with the Latin *uro* which of course *(us-si, us-tum)* must be referred to the root *ush;* and, as Pictet observes, (Les noms celtiques du soleil), la ressemblance avec l' hébreu *or, ur*, lumière, semble donc purement fortuite.

(2). Dr. Forster continues, "I have no Afghans to confer with on the matter, but I possess Elphinstone's Cabul; and will undertake, in the second word of his "Pushtoo Vocabulary," to find a second Hebrew word: viz. שמים, *Samim*, with the article prefixed, השמים, *hesamin*, 'The heavens,' of which the Pushtoo, '*Asman*, *Heaven*,' is clearly only a dialectic variation. I notice this merely as a specimen of Dr. Wolff's carelessness and hastiness of examination."—This, the readers of the Journal need not be told, would prove too much, and hence nothing; inasmuch as آسمان is also pure Persian; *asman* also occurs in Zend and the

* On the change of *d* into *l* see below.

cuneiform inscriptions in the same sense; and the Sanskrit *açma* is "a cloud." There may possibly be a general connection between this thoroughly Arian word, and the Semitic, not peculiarly Hebrew, root שמא, but that is all.

(3). "A third Hebrew term in the Pushtoo language, not in Mr. Elphinstone's catalogue, *viz.* נהר, *nahar*, a river, has been elsewhere noticed in the Pushtoo term *Ning-nehar*, the nine rivers."—Nor will this corroborate Mr. Forster's position materially. *Ning-nehar* (the name of a locality beyond the Peshawur Frontier) is far more frequently written and called ننګرهر (ningrahar), or ننګهار (ningahár), so that the *nahar* necessary for the proof entirely disappears. Were there a *nahar* in the word, the derivation given could not be relied on, as it is given by Afghan etymologists, who are almost as wild as Mr. Forster himself. In this case they are themselves not agreed as to the derivation; for some say the name is نیم‌نخر *(ním-nahar)* "half-hungry," and that the region is called so from the frequent scarcity of bread there; others say the name is really نیک‌انهار *(nekanhár)* "the good or pure streams; *anhár* is a pure Arabic plural—the Hebrew plural would be quite different. And lastly, نهر is not a Pushto word at all, is known only in the book language, and not among the people; and even if the latter were the case, it would prove nothing; for if a connection between the Hebrew and the Pushto is to be proved, all such words must be excluded from the evidence as are common to the Arabic and Hebrew; for everybody is aware that all Mahomedan nations use Arabic terms very largely, whatever their language be.

If such sporadic resemblances as the Philo-Semitics have hitherto searched for, helped the matter at all, one might be ready to suggest to them to compare the Hebrew חק (kheq) with the Pushto غيږ (ghe*j*)* "embrace," which is pronounced by the Khalíl, Momund, and

* This article does not adopt, in its spelling, either of the two standard alphabets that have been proposed; the reader will have no difficulty, it is apprehended, in making out the words. The vowels have the continental sounds, as proposed by Sir William Jones: the consonants their general English value; *kh* = خ; *gh* = غ; *j* the Pushto ږ which answers most completely to the Polish z; *zh* = the Persian ژ which in the same manner is pronounced precisely like the Polish *z* (*s* in "pleasure" is between these two sounds); ç = Sanskrit श.

Yúsufzai "gheg." But careful investigation will at once prove that "ghej" is the proper pronunciation, and that it has the same parentage with the Persian آغوش; آ is the inseparable particle, common to the Sanskrit, Zend, Parsi, and Persian, as in آشنا آشام آشوب آمدن آوردن آمیختن, etc. etc. The final ش, in Persian, often becomes ږ in Pushto, as غوږ = گوش; خوږ = خوش; the substitution of the vowel *e* for *o* is a mere dialectic variation; the Banúchís, for instance, constantly say *mír*, *kír*, *lír*, *kim*, for *mor*, *kor*, *lúr*, *kum*, etc.

The Pushto لوبه *(loba)* "play" might be imagined to be connected with the Hebrew לָעַב; only it is much easier and far more correct to derive this Pushto word directly from the Arabic لعبه, of the same signification, by the analogy of scores of similar instances, the Afghans pronouncing ع generally like *o*,—an incidental proof this that their own original speech has not this Semitic guttural.

Or the Semitic advocates might be told that *da* is used in Pushto to form the Genitive, whilst דִּי *(dí)* or דְ *(de)* in Chaldee is constantly used to form a relation very much like that expressed by the Genitive; and it is not unlikely that this constant recurrence of *da* in both Pushto and Chaldee may have imposed on Sir William Jones. It must be considered, however, that *da* also forms the Genitive in Panjábí, but as a postposition, like *ka* in Hindustani; it is more likely that the Pushto *da* is connected with the Latin *de*, which again reverts, in the Romanic languages, to form the Genitive. In Polish, the Latin *de* is most frequently translated by *od*, which is beyond a doubt the Sanskrit *adhas;* whether *de* is for ade = adhas, as Benfey suggests, is another question.

Dá also is the demonstrative pronoun both in Pushto and Chaldee; only it is so in Zend also, and though the Afghans would like to make out their relationship to the Israelites, their language prefers to be considered an ancient relict of Zend.

But, at all events, sound philologists have long since abandoned and reprobated the plan of establishing the affinity of languages on sporadic resemblances traced in their vocabularies. Organic identity in grammatical structure, added to a large community in certain household words, is necessary definitely to determine such questions.

However, the learned decypherer of the pictured rocks seems himself not quite firmly convinced of the Hebrew origin of Pushto, as,

a few pages on, he catches at a statement of Ibn Haukal's that Pushto is a Tatar dialect (he says, "Tartar"), and makes many apologies on behalf of the Afghans for having exchanged Hebrew for a Tatar dialect.

In return, one ought to be ready to make every allowance for Mr. Forster. His book was published in 1854; the materials for becoming acquainted with Pushto were then not readily accessible to an English scholar, who probably would care little for Russian publications though they be in the English language; it is not likely that he had seen Captain Vaughan's "Grammar of the Pooshtoo Language" which was published in Calcutta in the same year; and Captain Raverty's Grammar was not published till 1856. It would be impossible now, with an apparatus like that contained in the last mentioned grammar, with its copious paradigms and examples, whatever be the value of the system or the rules,—it would be impossible now to fall into the wretched mistake of calling an Arian language a Semitic one. Alas, for human hopes! What if the guide himself should lead you astray? Not wilfully perhaps, but blindly?

After devoting ten years to the study of Urdu, Persian, Marathí, Guzerathí, Arabic, Pushto, Sindí, Punjabí and Multaní (see the Preface to Capt. Raverty's "Grammar of the Pukhto," p. vi.), and after writing a copious Pushto Grammar with all the grammatical terms in Arabic, Capt. Raverty *is* inclined to consider the Pushto a Semitic dialect (see the Introduction to the Grammar, p. 36). Nay, he is more than inclined; he produces five arguments in favour of the view:—

(1). The vowels and consonants used in Pushto have the same powers as those of the Arabic, Hebrew and other Semitic dialects.

(2). Like them it has two genders.

(3). In common with the Hebrew, Arabic, and Persian, it has the peculiar separable and inseparable pronouns.

(4). The inflexions of the "Afghánian" verbs are formed according to the Arabic, and Hebrew system, with two original tenses only.

(5). In many respects the Pushto syntax agrees with that of the Hebrew.

Before examining these arguments, it may be worth while to inquire what could have led Captain Raverty so grievously astray

And we shall find the cause to be a very common source of error, namely a pre-conceived theory. Capt. Raverty seems hastily to have taken up the opinion that the Afghans are children of Israel, and so all goes wrong.

Let the reader bear in mind that it is desired to keep the linguistic question quite unencumbered, and that the writer of this notice does not intend to enter upon the ethnological question in this place. But it is difficult to pass over a remarkable phenomenon in the Introduction here spoken of. In p. 30, Capt. Raverty somewhat pertinently observes that had the Afghans "been the aborigines of the country at present known as Afghanistan, we must have heard something of them from ancient writers, for we find that even in the time of Herodotus, Darius had sent an exploring expedition under Scylax of Caryanda and others as far as the Indus." He then goes on to cite two passages from some English translation of Herodotus, in both of which the Afghans are mentioned, but he does not see it. The first passage states that Scylax "set out from the city of Caspatyrus and the country of Paktyica, and sailed down the Indus." The second says, "there are other Indians bordering on the city of Caspatyrus and the country of Paktyica, settled northwards of the other Indians."

Had the Afghans, says Capt. Raverty, been then in these regions, their name must have occurred in these passages. Granted; what name? Not *Afghan*, for that is a modern name, given them by the Persians, not acknowledged by themselves, and certainly not occurring before the time of Abu Said, who ruled in Khorasan during the fifteenth century. Their own name in the country near the Indus, to which the citations refer, is *Pakhtu* (n); how would a Greek have spelled this? Πακτυ, I trow. This word, in the plural number, the reader will find in *Hdt.* VII. 67, where the different nationalities are enumerated that constituted Xerxes' army. The Πάκτυες (Pakhtus) are described as wearing *posteens*, and carrying native bows and knives, not a bad description of Afghans at any time; and they are duly mentioned after the Bactrians, Parthians, Khwarismians, Sogdians, and Gandarii (Kandaharís?)—Even the peculiar form of the name *Paktuika* as the name of their nation or their country finds its explanation in the fact that the Afghans call themselves collec-

tively *Pakhtunkha*. Very few native names suffer so little on the part of Englishmen, as these names have suffered at the hands of the Greeks. Capt. Raverty says that the country referred to under the name of Paktuika is Puklí; this also is a mistake, for the Greeks called the latter, which moreover is not near any navigable portion of the Indus, plainly and correctly Πεύκελα; the name occurs a number of times in Arrian.

As for Capt. Raverty's arguments in favour of the view that Pushto is of the Semitic family, Argument No. 5 says that in many respects the Pushto syntax agrees with that of the Hebrew. This argument would be valid, if the grammarian had pointed out some *peculiarities* in the syntax of the one language which agree with peculiarities in that of the other. For the good of his argument, it must be regretted that he has not done so, and the proposition as it stands may be predicated of any two languages whatsoever. No. 2, also proves too much; for French, Spanish, Italian, Portuguese, Gaelic, Danish, Livonian, etc., or, what is more to the point, and might have led a candid inquirer into the right track, the Indian languages, such as Hindi and Panjabi, have also but two genders.

What the force of Argument No. 1 is, that "the vowels and consonants used in Pushto have the same powers as those of the Arabic, Hebrew, and other Semitic dialects," is difficult to tell. If the author has reference to the *spoken* vowels and consonants, that is to their sounds, it is sufficient to observe that of articulate sounds there is only an extremely limited number, in consequence of which the great bulk of the vowels and consonants of all languages are the same. He cannot mean that *all* the Pushto sounds are found in the Semitic languages, for he has just laboured for some pages to prove that both there are many of the Arabic sounds which are not found in Pushto, and that there are a number of Pushto sounds not to be found in the Semitic languages, though his statements are by no means complete, or correct as far as they go. If he refers to the *written* character, Semitic scholars will be surprised to hear that there are letters in the Syro-Arabian languages to express vowels at all. And as regards the consonants, every one knows that when Bayazíd, or whoever may have better claims to the distinction, wrote Pushto first, he made use of the Arabic character, and that not the pure

character, but as he knew it from Persian writing, with the addition of all the three pointed letters, and that even then he had to modify half a score of letters besides to express all the Pushto sounds, in which he succeeded only partially. He would have reduced his difficulties very materially, had he used the Devanagari alphabet, in which the Sanskrit and Prakrit languages can be written with greatest ease; and that Pushto is one of the latter, this matter of the letters alone would be sufficient to establish.

The validity of Argument No. 3,—"in common with the Hebrew, Arabic and Persian, it has the peculiar separable* and inseparable pronouns, the latter being invariably attached to some preceding word"—is very much impaired by the author's adding Persian to the other two languages. Is Persian also a Semitic language?

It is not at all necessary to be acquainted with Pushto to suspect this argument; for to compare the graceful freedom of the Persian inseparable pronouns م—, ت—, ش—with the rigid compulsoriness of those of the Semitic languages is the same as to say, "There is a river in Macedon; and there is also moreover a river at Monmouth." But the oddity goes much further. Any one acquainted with Pushto would rack his brains to discover what the author could mean; he would probably conclude that he must refer to combinations like زړونم *corda nobis*, which might seem to bear some similarity to دلم, but which occur so excessively rarely that not only could they not be adduced as a characteristic of the language, but any Grammarian would be excused for not noticing them at all in his grammar. Nor does Captain Raverty. What he means by the inseparable pronouns, are the common terminations of the verb: laudo, —as, —at, —amus, —atis, —ant. These terminations Capt. Raverty calls "affixed personal pronouns." The comparative philologist will probably say, so they are. True; only Capt. Raverty has no inkling of the truth, for he calls them *zamáiri mutasila*, which are quite different things.

* What part of speech either in Pushto or Hebrew or Arabic or Persian could possibly be called a "separable pronoun," is quite beyond divining skill. It is most probable that the grammarian means "separate" pronouns; but as there is nothing peculiar in the existence of separate pronouns in any language or number of languages, the examination of the argument confines itself to the inseparables.

This grammatical term has been introduced into the Persian Grammar also by ignorant native compilers in India, but quite improperly. It is a pity that Capt. Raverty has thought fit to encumber his otherwise not very clear or correct or practical grammar with the inept terminology of Arabic grammarians. There can be no stronger proof of the Arian nature of the Pushto than that which Capt. R. calls "affixed personal pronouns."

Argument No. 4, states that the inflexions of the "Afghanian" verbs are formed according to the Arabic and Hebrew system, with two original tenses only.

Unless it be admitted that such a statement can originate only in the sheerest ignorance of the nature of the Semitic verb, it is difficult to disentangle the manifold confusions implied in it. It compares incommensurables; it says that an ounce is as long as an inch. How utterly alien and foreign the tenses of the Semitic verb are to Occidental, that is Arian, modes of thought and expression, becomes glaringly apparent, for instance, in the voluminous investigations of their nature, say, in the Hebrew. Hardly two grammars of the language have the same nomenclature for them. With some they are the past and the future, with others the definite and indefinite, with others the perfect and imperfect, with some even the anterior and posterior; Donaldson (Comparative Grammar of the Hebrew Language) shrewdly does not call them anything but Primary and Secondary, which terms have reference merely to their form, and only ventures to say that the former expresses single or transitory acts, and the latter represents repeated or continuous action. A perusal of a few sentences of the Hebrew Bible is sufficient to convince any one that the mere precession of the particle "and" is sufficient to make the form that otherwise expresses the future, denote past action, and vice versâ. How utterly different is this from the Grammar of the Indo-European languages. Indeed, the manner in which time is expressed in the Semitic tongues, cannot be understood, unless, as Nordheimer, the profoundest of Jewish Grammarians, somewhere observes, We occidentals discard the notions we have acquired as to the proper function of the tenses. This is not the place to discuss the nature of the Semitic tenses, but it is distressing to see that which peculiarly characterizes the modern Arian languages mistaken for marks of identity with ancient Semitic peculiarities.

By "original tenses," Captain Raverty means those that are not formed with the auxiliary *to be*. If we consult his grammar for further light on this subject, we shall find him giving page after page, not two, but *four* such "original tenses." He calls these, present, aorist, imperfect, and past. On further examination, we shall find that what he calls the aorist, is no tense at all, as is proved by the very quotations that he constantly gives, but is the subjunctive mood. Then we are struck by the fact that the past of regular verbs differs from the imperfect only by an augment. We have then the clue to the grammarian's statement. His two "original" tenses are the present and the past imperfect tenses which the Semitic languages have not at all. But a candid comparison would at once have shown that those languages which have these only as simple tenses, such as Parsi, Persian, Russian, Polish, Swedish, Danish, German, English, and others, are all Arian languages.

Compare these two tenses in Pushto: *wah-am*, *wah-alam*, (=Latin caedo, caedebar,) with the corresponding ones in Polish, for instance: *gr-am*, *gr-alem*. They differ in meaning in this, that the past tense of the Polish is active, and that of the Pushto has a passive sense. How thoroughly the latter is characteristic of the Sanskrit and many other Indian languages, few readers of the Journal will need to have pointed out to them. It is curious that the European languages, even the ancient ones, seem to have lost this preference of the passive construction in the past tenses to the active, though it may still very distinctly be traced, in Latin, in the favourite gerundive construction, in the form in which the ablative absolute most frequently appears, and in the peculiar conception that must exist in the mind of the speaker or writer who can form a passive voice of verbs like "to go" and "to come."

Such astonishing confusion having been introduced into what is really a very simple question, it is worth while to inquire what are the essential features that distinguish the Semitic from the Arian stock of languages. Contradiction need not be feared, if they are stated to be the following:—

1. The Semitic languages, in historical times, consist of triliteral and hence polysyllabic roots, the three letters being all consonants.

2. The roots express the *ideas*, whilst *relations* are denoted by an

internal modification of these roots, effected by vowels, aided by certain letters termed *servile*.

3. Such modification alone produces from the simple root the differences between verb and noun, adjective and substantive, gender, number, and tense.

4. In addition to the distinctions of gender known in the Arian languages, the Semitic languages also distinguish gender in the pronoun of the *second* person, and in the *second* and *third* person of the verb.

5. Tense-formation is undeveloped.

6. Composition, with immaterial exceptions, is unknown.

These features will in vain be searched for in the Pushto language.

Pushto will attract few students by its literature; excepting those who pay attention to it for practical purposes, it is of interest only to comparative philology and its cultivators; and to them, it would be interesting mainly on account of its antique look. There is no doubt that it has preserved many forms, either altogether, or in more original shapes than are to be found in most of the other Arian languages; that is, in its vocabulary, not in its grammar, which is on a par with most of the descendants of Prakrit.

What grieves and perplexes etymologists so often, is the existence of orphans in the various branches of the great Arian family, stray little things that have lost all love and likeness to their reputed parents, or whose parents have been so long dead that nobody can remember who they were. The entrance upon a comparatively new field sometimes discovers twin-brothers of such orphans, which discovery relieves the anomaly at least in some measure. Let a few examples from the Pushto suffice.

The Greek *ταργάνη* is a *rope-basket*, a net-work made of rope, *πλέγμα τι ἐκ σχοινίου*, says Suidas. Benfey (Griech. Wurzel Wörterbuch, I. p. 670) is quite perplexed as to its derivation, and Semitic roots which have been compared by some are of little advantage. The Pushto has ترګۍ *(tragaṅ)*, Panjabi *tangar* for those rope-baskets the Afghans so universally use to carry their loads and burdens in. It is not a little interesting that the Apostle Paul uses this word

(2 Cor. xi. 35*) in describing his escape from Damascus, whilst it is a well known practice among the Afghan thieves to use this very means for letting their accomplices down walls and windows.

The Latin *tussis* (cough) has as yet not been traced; Pott suggests, though but timidly, that it might be connected with *tundo;* the Pushto for "cough" is *tushe.* The Greek εὕδω, "I sleep," "lie down" appears to be as yet without an authentic genealogy; the Pushto اوډ (*údö*) is "asleep, lying down;" αυλή, the court-yard, cattle-yard, etc. is a difficult word; the Pushto غولي *(ghole)* precisely answers it. Pushto کاڼړي *(kañre)* "a stone" is difficult to affiliate either in the Sanskrit or Persian, but it seems to have two equally lonely brothers in the Gælic *earn* "a cairn," and the Greek κραναός "stony."

The English *ant* and the Persian *mor* مور, of the same signification, seem wide apart, yet by the aid of the Pushto we are able to point out a very probable connection between them; *ant* is for *amt*, contracted from *emmet*, from the Gothic *amaitô* according to Grimm; from this the German *a-meise;* the Pushto is میږے *(meje)*, also pronounced *mege*, which connects with the second syllable of the Greek μυρμηκ—whose first syllable agrees not only with the Persian *mor*, but with thirteen other languages (cited by Grimm in the Deut. Wörterbuch) whose word for *ant* is similar to *mor* or μυρ; from which the conclusion may be drawn that the Greek is nearest the original word whatever that was, and that the descendants have divided the inheritance, some taking the first, others taking the second syllable. Such a division of inheritance is by no means unexampled; for instance the German *ente* (Lat. *anat)* and the English *drake* meet in the Old High German *anetrekho;* the Irish *gall* (swan) and the Slavic *labud* (of the same signification), philologists find united in the Sanskrit *jálapád*, though neither of these cases is quite parallel to that of μυρμηκ.

The Greek ὠόν and the English *egg*—are, as is well known, closely related: ὠόν, Latin *ovum*, Irish *ugh*, Saxon *æg*, English *egg;* the change of *v* into *g* is one of such frequent occurrence as hardly to need an

* It appears there in the dialectic variation σαργάνη; the change of τ into σ being like Ionic ἄνησος for Doric ἄνητος, σύ, σέ, σημερον for Doric τύ, τέ, τήμερον, ναυσία = Attic ναυτία, etc.

exemplification; but compare Sanskrit *vṛka* with the Persian گرگ (wolf); Latin *vespa* (wasp) with the French *guêpe;* Persian گرم (garm) with German *warm; vesper* = Welsh *gosper;* and all the Spanish names beginning with *guada* from the Arabic وادي "a river." —But it is curious that both the Greek and the English variations of the same word should have their representatives in Pushto: the Northern dialect has *hagge*, the Southern *oë*. So, in the same manner as the German *weide* is to the English *willow*, so is the Persian بيد to Pushto ولە *(wüla)*. The Pushto is extremely fond of changing *d* into *l*. In the European languages this change of the dental into *l* is not common, if the Spanish perhaps be excepted, which gets, for instance, the *Madril-eños* from *Madrid*, and evidently manufactured the name *Isabel* from *El-izabeth*, not unlikely mistaking the initial *El* for an article. The Latin shews a few words with that tendency; the connection between the English *tear* and the Latin *lacryma* would be difficult to demonstrate but for the Gothic *tagrs* = Greek δάκρυ (δακρυ-μα); the connection between *lingua* and *tongue* can only be through an intermediate *dingua* which is an antique Latin form. So the Sanskrit *madhu* remains in Greek *μέθυ*, German *meth*, English *mead*, Polish *miód* etc.; but in Latin it is *mel*. In the same way, the Sanskrit *devri* (husband's brother) retains the *d* sound in Greek, Lithuanian, Livonian, Slavonic, Servian, Armenian, and Saxon, but the Latin has *levir*, and the Pushto also *lewir* (ليور); the nearest Persian word seems to be دادا which is used for a brother in a wide sense. (Comp. Bopp. Vergl. Gramm. 17).

This change of the dental into *l* is so much the more remarkable as the Zend has no *l;* and it may serve to show the affinities of the Pushto, to those who have no inclination to study the language, to give a few instances of this preference of *l* over *d* or *t*.

Hindustani	دس	Pushto	لس (las) ten.
Persian	دست	„	لاس (lás) hand.
„	ديوانه	„	ليوني (lewanæ) mad.
„	پدر	„	پلار (plár) father.
„	دام	„	لوم (lúm) net.
„	ديده	„	ليده (lída) seen.
„	دامن	„	لمن (laman) skirt.
„	دارم	„	لرم (laram) I have.

Pers. سپند Pushto. سپيلني (spelane) rue; metathesis unavoidable after the change.

„ خود „ خول (khol) helmet.

„ پودنه „ ويلني (welane) mint.

It has already been intimated that the affinities of the language to the Zend are great; the only two languages that may be thought able to dispute this claim, would be the Sanskrit on the one hand, and the Persian on the other. An examination of the numerals and a few other words may help to clear up this matter and put the reader in a position to judge for himself.

Sans.	eka	Pers.	يک	Zend	aéva	Pushto	يو (yau)—	1.
„	dvi	„	دو	„	dva	„	دوه (dwa)—	2.
„	tri	„	سه	„	thri	„	دري (dre)—	3.
„	chatur	„	چهار	„	chathru	„	څلور (tsalor)*—	4.
„	panchan	„	پنج	„	panchan	„	پنځه (pindza)—	5.
„	shash	„	شش	„	esvas	„	شپږ (shpaj)†—	6.
„	saptan	„	هفت	„	haptan	„	اوه (uwa)‡—	7.
„	ashtan	„	هشت	„	astan	„	اته (ata)—	8.
„	navan	„	نه	„	navan	„	نه (nö)—	9.
„	daçan	„	ده	„	daçan	„	لس (las)—	10.
„	ekádaça	„	يازده	„	aevandaça	„	يولس (yúlas)—	11.
„	dvádaça	„	دوازده	„	dvadaça	„	دولس (dúlas)—	12.
„	trayodaça	„	سيزده	„	thridaça	„	ديارلس (dyárlas)—	13.
„	chaturdaça	„	چهارده	„	chathrudaça		څورلس (tswarlas)—	14.
„	vinçati	„	بيست	„	víçaiti	„	شل (shil)§—	20.

* The change of the dental into *l* as above; the change of *ch* into *ts* is characteristic of the language; it is really only a change of *sh* into *s*.

† The change of *v* into *p* is exemplified in words like Sanskrit açva = Zend aspa; Sanskrit sventa = Zend spenta; Sanskrit vartaka = Greek πέρδι-κ; though the opposite change also occurs, e. g. Latin sapere = French, savoir; Latin intrepido = Spanish atrevido; Latin lupa = Spanish lova: Latin porta = Russian vorota; Latin caper = French chêvre, etc.

‡ This change looks severe, but it has been fully recognized by Pott (Quinare und Vigesimale Zählmethode, p. 270); it really implies nothing more than the change of *p* into *v* or *w*, just noticed, after dropping *t*; examples of the latter are the second person plural of the verb in Spanish as compared with the Latin teneis for tenetis, crais for cratis; Sk. patni = Pol. pani, etc.

§ This loses the first syllable *(vi)*, drops the last vowel, and changes the dental

Sans.	trinçat	Pers.	سي	Zend	thriçata	Pushto	دیرش (dersh)*— 30.
„	chatvárinçat	„	چهل	„	chathvareçata		څلویښت (tsalwesht) 40.
„	pancháçat	„	پنجاه	„	pancháçata		پنځوس (pandzos)—50.
„	shashti	„	شست	„	csvaçti	„	شپیته (shpeta)— 60.
„	saptati	„	هفتاد	„	haptáiti	„	اویا (awyá)— 70.
„	açíti	„	هشتاد	„	açtáiti	„	اتیا (atiyá)— 80.
„	navati	„	نود	„	navaiti	„	نوي (nwí)— 90.
„	çata	„	صد	„	çata	„	سل (sal)†— 100.
„	çvan	„	اسپاه or سگ		spá	„	سپي (spæ) dog.
„	aham	„	من	„	azem	„	زه (zö) I.
„	tárá	„	ستاره	„	stáre	„	ستوري (store) star.
Prakrit	se	„	وے	„	hé	„	ئي (ye) him.
Sans.	çushka	„	خشک	„	hushka	„	وچ (wuch) dry.
„	svap	„	خواب	„	qaf	„	خوب (*kh*ob) sleep.
„	svasá	„	خواهر	„	qaṇha	„	خوپندي (*kh*wainde) sis-
						„	خور (khor) sister. [ters.
„	khan	„	کن	„	kan	„	کنه (kana) dig.
„	sam	„	هم	„	ham	„	هم (hum) also.
„	sarva	„	هر	„	haurva	„	واړه (wáṛa) all.
„	dháv	„	دو	„	du	„	دو (dau) run.
„	hrid-aya	„	خرد or دل		zere-dhaya		زړه (zṛö) heart.
„	hir-anya	„	زر	„	zara	„	زر (zar) gold.
„	jír-na	„	زر	„	zar	„	زور (zoṛ) old.
„	harit	„	زرد	„	zairita	„	زیر (zyar) yellow.
„	hima	„	زم	„	zima	„	ژمه (zhima) winter.
Ved.	jma	„	زمین	„	zema (huz- varesh צמיק)		زمکه (zmaka) earth.

into *l* as usual; but in the compound numbers, 21, 22, etc. another form much closer to the Zend appears: دویشت یو ویشت etc.

* In the Zend, it is evidently the çata which expresses the tens; of this the Pushto retains the first letter alone; in the following number, 40, it curtails the Zend much less; indeed it loses only the unessential termination, and the single letter *r* which is lost by being crowded out. It has already become plain to the reader, that it is long and weighty vowels only that survive in the modern languages; the short ones are soon lost by attrition.

† The dental into *l*.

Sans.	çiras	Pers.	سر	Zend	sara	Pushto	سر (sar) head.
„	? svar	„	خور	„	hvar (e)	„	نور (nwar) sun.
„	vah	„	(آویز)		vaz	„	باسه (bása) carry.
„	upari	„	بر	Parsi,	awar	„	پر (par) over.
„	paçu	„	سفند (گو)	Zend	pashu		پسه (psa) sheep and goats.
„	pri	„	فروش	„	pereta	„	پیرودهٔ (píroda) bought.
„	jihvá	„	زبان	„	hizva	„	ژبه (zhaba) tongue.
„	sthorin	„	ستور	„	staora	„	ستر (star) steer.
„	kshapá	„	شب	„	esap	„	شپه (shpa) night.
„	mṛ	„	میر	„	mar	„	مړ (maṛ) dead.
„	mása	„	ماه	(* mah I. C.)		„	میاشته (myáshta) month.
„	para	„	فرا	(frá I. C.)		„	پوري (pore) beyond, far.
„	madhya	„	میان	Zend	maidhya	„	مینځ (myandz) midst.
„	prishtha	„	پس	„	parasta	„	ورستو (wrusto) back.
„	vrish	„	بارش	„	vár	„	وریدل (war-edal) to rain.
„	vana (forest)		(گلبن in بن)		vana (tree)		ونه (wana) tree.
„	nedistha (nearest)	„	نزد	„	nazdista	„	نژدي (nazhde) near.
„	hasta	„	دست	„	zaçta	„	لاس (lás) hand.
„	jan	„	زا	„	zan	„	زوول (zo-wul) to be born.
„	pach	„	پز	„	pac	„	پوخ (po*kh*) cooked.
„	(çuch, to shine)	„	سرخ and سور	„	çukhra (Parsi سوهر)	„	سور (sor) red.
„	çarad (autumn)	„	سرد	„	çareta	„	سور (soṛ) cold.
„	ap	„	آب	„	ap	„	اوبه (oba) water.
		„	خور	„	qar	„	خوړ (*kh*oṛ) ate.
				„	spar (ré-pandre)	„	سپړي (spaṛe) open.
„	vid			„	zda†	„	زده (zda) knowing.
„	chhuri-ká			„	suwrá	„	توره (tura) sword.
„	tar (e.g. tiras = *trans*)				taro‡	„	تیر (ter) passing.
„	giri			„	gairi	„	غر (*gh*ar) mountain.
„	parama (*primus*)			„	frathemo	„	وړنبي (wṛum-be)§ first.

* I. C. for Cuneiform Inscriptions.

† In Ahura-ma-zda (Ormuzd) = Lord Multiscient.

‡ Lassen, Anthologia Sanskritica, p. 135.

§ *b* is an inorganic addition, of frequent occurrence in most languages after *m*,

The following also are submitted to the inspection of the learned reader, though I have not met with their Zend equivalents; literary material is not abundant on the Afghan frontier.

Sans.	púrven (-dyus)	Pers.	پرن	Pushto	پرون (parún) yesterday.
„	svádu	„	خوش	„	خوږ (*kh*waj) sweet.
„	sveda	„	خوی	„	خولي (*kh*wale)* sweat.
„	hanu	„	زنخ	„	زني (zane) chin.
„	khalváta	„	کل (bald)	„	کلوه (kalawa) shave.
„	keça (hair)	„	گیسو	„	کوسي - (kausai) ringlets.
„	laghu (*light*)	„	لخت (or لخلخ)	„	لږ (laj or lag) little.
„	duh	„	دوش	„	لوش (lwash) milk thou.
„	lomaçá	„	روباه	„	لونډۀ (lombaṛa) fox.
„	charman	„	چرم	„	څرمن (tsarman) hide.
„	makshi-ká	„	مگس	„	ماشي (máshe) midge. مچ (mach) fly. مچي (muchai) bee.
„	músha	„	موش	„	مړۀ (maja) mouse.
„	krid, kruç	„	گریه - زار	„	ژړا (zhaṛá) cry.
„	ve	„	باف	„	وه (wa) weave.
„	sevaní	„	†سوزن	„	شتن (stan) needle.
„	bhrú	„	ابرو	„	وروځه (wrúdza) brow.
„	vríhi	„	برنج	„	وړيجي (wríje).‡ rice.
„	vára	„	بار	„	وار (wár) Fr. fois.
„	grí	„	اغار	„	نغړي (n*gh*rí) he swallows.
„	pá			„	پوول (po-wul) to feed.
„	pay-as			„	پي (pay) milk.
„	túr			„	تير (ter) swift.
„	chhid			„	چود (chaud) split.
„	chír-na			„	څيري (tsíre) torn.

as *dumb*, *thumb*, for German *dumm*, *daum*; or *chambre*, *hombro*, *hambre* for *camera*, *humero*, *fame* (s).

* *D* into *l*.

† *Vullers'* derivation from سوي زن "latus feriens" does seem to be marvellous nonsense, when the Latin *suo*, Gk. *συω* (in *κασσύω*) and the Sanskrit root *siv* (Westergaard, Radd. Ling. Sans. p. 261) are considered.

‡ Lassen conjectured that the old Persian ought to have been *brízi*; the Pushto seems to add much force to his inference.

Sans. kshur		Pushto خريه (*kh*raya) shear.	
„ stana (breast) (compare الخ p. 3)		„ ستوني (stúnæ) throat.	
„ ura		„ وړي (waṛai) wool.	
„ lap (say)		„ لوۀ (lwa) read.	
„ lap, (Benfey, Griechisches Wurzel-lexicon, II. p. 127).		لنبه (lamba) flame.	
„ masyádhára	Pushto مشوانړي (mashwánṛe) inkstand		
„ mil (societatem inire)	„ مل (mal) companion.		
„ madana	„ مينه (mína)* love.		[*vereor.*
„ bhrí	„ ويرۀ (wyara) fear;		cf. Lat.
„ vish	„ ويش (wesh) division.		
„ váṇí	„ وينا (wená) speech.		

The foregoing list the reader will observe consists only of words whose identity with their equivalents in the sister languages may be recognised at a glance; if it were extended so as to include such as can fairly be proved, by the recognised rules for the shifting of consonants *(Lautverschiebungsgesetze)*, to be unmistakably Arian, by far the greater portion of the entire vocabulary would have to be transcribed.

A cursory inspection of this list will convince the reader that it confirms the truth of the philological maxim that comparatively rude dialects preserve old forms better than their more polished relatives; hence for the etymological investigation of the Persian an acquaintance with Pushto would be more than merely useful. Vuller's Lexicon would have been far more satisfactory, or rather far less unsatisfactory, if the author had availed himself, for the etymological portion of his work, of the connecting links the Pushto offers. The length to which this paper has already grown, will admit of but an instance or two of such links as one may expect to find.

* Compare the German *minne*. The connection with the German will most probably be doubted, at least by Germans, as it is the fashion to connect *minne* with the very opposite of the root of *madana*, which is *mad*. It is possible that the Pushto *mína* is allied to *Venus*, and the Sanskrit root *van*; the change of *v* into *m* is quite common in Pushto: *nwar* (Zend hvar) is pronounced *nmar*; *newasi* (Latin nepos), *nmasai*; Persian نواز = Pushto نمانز (nmanz), etc. analogous to the Latin *mare* for Sanskrit *vári*.

Under ابريشم "silk" Vullers is mute, as alas he is in most places where one would look for information. In Pushto وريشل *(wresh-al)* is "to spin," which at least shows that the *a* in *abresham* is prosthetic, for euphony, and that the original meaning of the Persian word is "that which is spun" by the silkworm. But at the same time a conjecture may be ventured as to the Greek ἀράχνη "*spider*" which may reasonably be supposed to be connected with a word for "spinning," like its equivalent in so many languages; the change of *v* into a vowel before *r* is quite common, e. g. Sanskrit vrih = Greek ὀρχ-έω; Pushto وربشي (wrbushe) = Greek ὄροβος (German erbse). Prof. Max Müller in another conjecture on the same word (Zeitschrift für Vergleichende Sprachforschung, 4, 368), makes a suggestion most worthy of consideration. He observes that a specific term in course of time often passes over into a general application, and that a word, for instance, denoting originally some peculiar kind of "making" adopts the sense of "making" generally; he instances τέχνη (art) from Sans. *tvaksh* (to work in timber); and Latin *ars* (art) from *ar-o* (I plough); and he goes on to say that the Sanskrit *rach* (to make) may originally have meant "to weave." This I would modify so far as to say that if a root for ἀράχ-νη must be sought for in Sanskrit, it may be *vraj* "to make,"* which may originally have signified "to spin;" and support the conjecture not only by the Persian بريشم (which would then be the original form of both ريشم and ابريشم, both forms being due to the same principle of dislike to a double consonant at the beginning of a word), and the Pushto وريشل *(wresh-al)*,† but also by the Greek πραγ—(do) and the Polish *praca* (work), both of them etymological *cruces* and *nuces;* and would venture to add even the English *work* and German *werk.*

Taking the Persian word شكار "hunting" by itself, it would seem rash to connect it with شكشتن "to break," which has for its Imperative شكن; yet this seems to be the connection on the analogy of the Pushto ماتي *(máte)* "hunting" especially that of the lion, as

[* This very rare root *(vrájayati)* is explained by the grammarians "to send," "to purify," rather than "to make" *("Vraja márgaṇasanskára-gatyoh.)*" Eds.]

† For the change of the consonant *j* into *sh* (vrij = wresh) cf. Sanskrit *jívámi* = Old Slavic *shivû;* Sanskrit *jná* = Persian آشنا, and the Highlander's *shentleman* for *gentleman.*

compared with مات *(mát)* "broken;" which again reminds one strongly of two difficult French words bearing the same relation to one another, viz. *chasser* "to hunt" and *casser* "to break."

Frequently the Pushto preserves the simple form of Persian compounds: فرستادن "to send" is evidently compounded with the Sanskrit स्; but the Persian ایستادن means "to stand" whilst the Pushto *ásta-wul (wul* is the Infinitive termination of transitive verbs) is "to send;" افشاندن (compounded with the frequent Sanskrit *abhi* = اف) "to scatter" has no simplex in Persian, but in Pushto "to scatter" is شېندل *(shandal);* نشاختن "to fix in the ground," compounded with the Sanskrit inseparable preposition *ni*, has no simplex in Persian, but in Pushto شخول *(shakh-awul)* is "to bury."

Such instances might be very largely multiplied, but only a few have been hastily culled, without much order, with a view, not to exhaust the subject, but rather not to weary the reader who may take a greater interest in the general philological question than in the Pushto language particularly; and these instances will at least show that a language cannot be Semitic which is so intimately connected in its lexical store (grammatical forms there is no room in this paper to discuss) with the prominent members of the Indo-European family of languages, and that in words not such as could be *borrowed* from another language, but such necessary every-day terms as form the staple of every language, and such as every tribe and nation, in their separation from the parent stock, take with them as a common inheritance.

Peshawur, August, 1860.

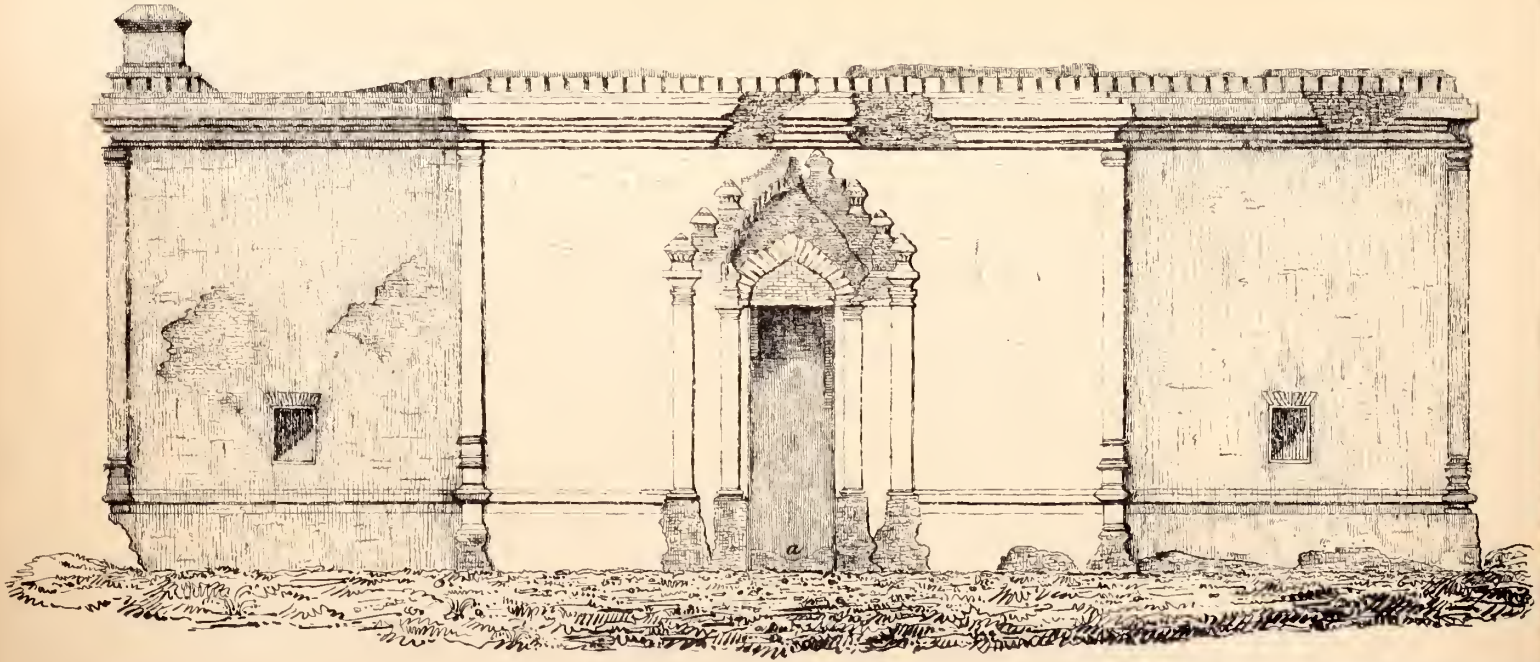
Remarks upon an ancient Buddhist Monastery at Pu-gân, on the Irrawaddy.—By Lt.-Col. A. Phayre, *Commissioner of Pegu.*

The ruins of the ancient city of Pu-gân are situated, as is well known, on the left bank of the river Irrawaddy, about three hundred and fifty miles above Rangoon.

In the southern portion of the ruined city, I discovered the remains of an ancient monastery. This was the first building of the kind that I had met with in Burmah, and it is probably in better preservation than any of the ancient Viharas built for Buddhist monks. The nature of the masonry, as compared with that of Pagodas at Pu-gân, the date of building which is known, leads me to believe that the monastery in question was built five or six hundred years ago. The building is constructed entirely of brick.

It is somewhat dilapidated. Still enough remains to show distinctly the nature of the building and its several divisions. The ground plan is shown in the sketch accompanying, and a rough front elevation is added. There was evidently no upper story.

The building consisted of a square of about 80 feet, the outer wall up to the top of its battlemented parapet being about 18 feet above the ground. Each corner had a pilaster supporting a deep cornice which ran all round the outer wall. The outer wall had been plastered, but this protection has now nearly disappeared. The corner pilasters rested on basement mouldings, which appear to have been placed nearly two feet above the ground; the chief entrance was on the eastern face of the building, and here there was a projection of about 15 feet from the main wall, forming a part of the outer room or vestibule. There was a corresponding projection on the opposite face where there was an elevated domed structure, for the reception of an image of Gautama. This was apparently, from what remains, some twelve or fourteen feet higher than the outer wall. Over the entrance door on the eastern side, there had been an ornamental canopy of flamboyant rays in plaster, such as is seen over most of the doors and windows of the temples of Pu-gân. This,



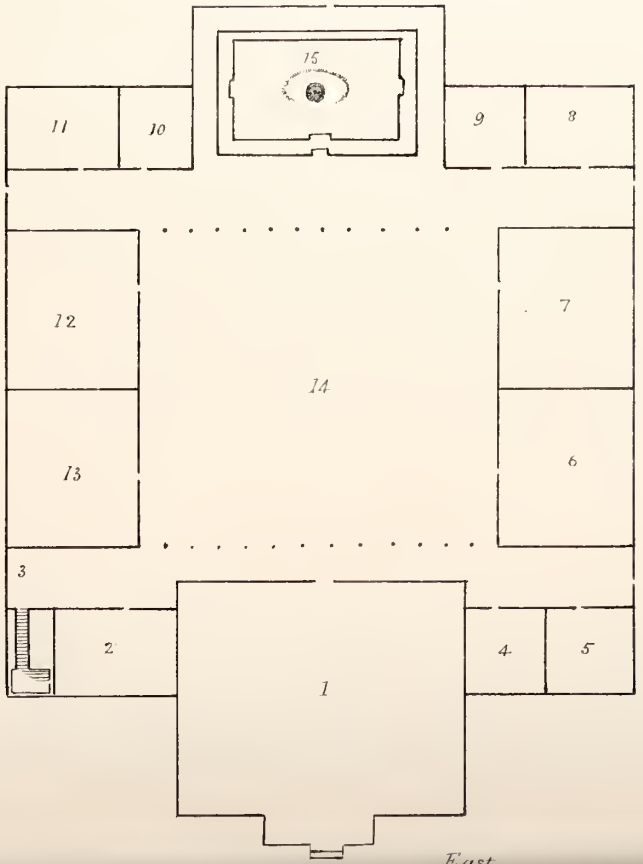
Front Elevation of an ancient BUDHIST MONASTERY at PUGAN.

ON TRANSFER PAPER AND LITHOG BY H. M. SMITH, SURV GENL'S OFFICE, CALCUTTA. OCTOBER, 1860

PLAN OF AN ANCIENT

BUDHIST MONASTERY

at PUGAN



References.

1 *Vestibule*
2 *Library ?*
3 *Steps to Roof.*
4 *to* 13. *Cells.*
14 *Open Court*
15 *Raised image of Budhu with crypt beneath*

however, is now nearly worn away by the weather. Entering this door-way, you pass at once into the vestibule or outer room, which is about 30 by 25 feet. From this you enter the main enclosure or central court of the monastery, more than 40 feet square, and into which open the principal surrounding cells, which were for the use of the monks. At the west end of this court, and directly fronting the main entrance, is an elevated domed tower, once surmounted by a graduated steeple now in ruins. Within the domed tower, at a height of about fifteen feet above the ground, was a *palleng* or raised throne, for an image of Gautama. This must ordinarily have been worshipped from below. There are no existing steps up to the tower, which probably was reached from the hall by a ladder when necessary. Beneath this throne was a vault below the level of the ground. A small opening and descending passage led down to it. In the vault also were places for images. This represented the cave which Buddhists love to construct, to remind them of places for retirement and devotion. The walls for the interior cells or apartments of the monastery are now not more than 10 or 12 feet high, and this appears to have been their original elevation. The interior walls have not been plastered. No portion of a roof anywhere remains. Each cell has a separate entrance door and window about 18 inches square. These are all formed with flat arches and no timber appears in any part of the building. It is not clear how the cells have been roofed or with what material, but probably with planks. Not a vestige of a tile was visible. The outer wall of the building is pierced to receive stone pipes to carry off the rain water from the roof. These are seen obtruding through the top of the outer wall below the parapet. The great centre room or court of the monastery has also been roofed but probably only with boards laid horizontally. The two dotted lines in the plan show where, from marks at the top of the inner walls of the side cells, two beams had probably rested. In a climate where it seldom rains, planks laid on rafters supported by these, would afford sufficient protection from the weather. This apartment was evidently the great hall of the monastery where the religious discourses and instruction would be conducted. The outer room would be that for the reception of strangers and probably for teaching the scholars, who daily attended for that purpose, as is now

customary at existing monasteries in Burmah. At the south-eastern angle of the building was an apartment differing from the others. It had several recesses in the walls and may probably have been the library of the establishment. At its southern end was a staircase which led up to a small turret on the roof. This was probably intended for the inmates to proceed to the roof in the cool of the evening.

The monastery was surrounded by an enclosure wall (now nearly all in ruins) about nine feet high. Each face was about 200 feet long. There was only the appearance of a gate at the centre of the eastern face. This was constructed with a double arch, indicating that the monastery had been erected by royal bounty.

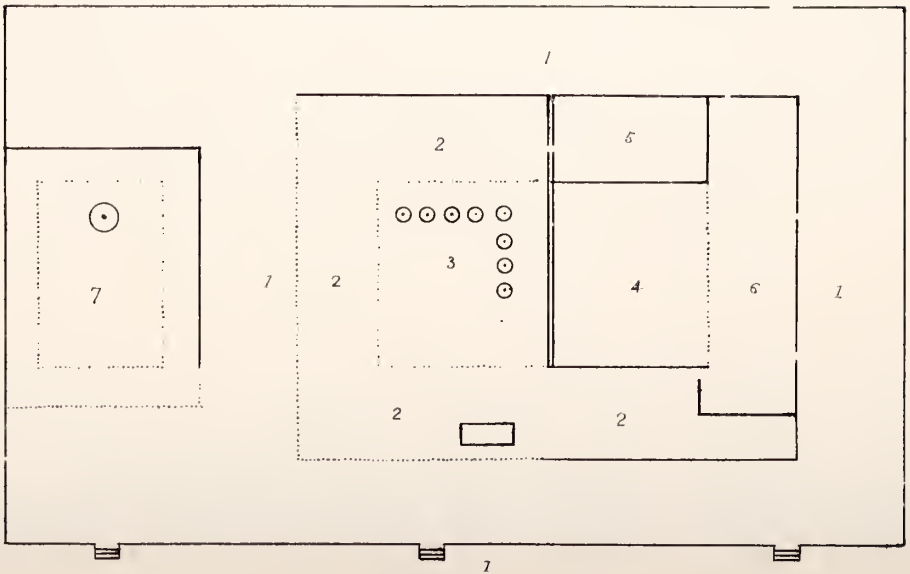
This building appears to have been constructed solely as a monastery or residence for monks, and with places for images of Buddha, but no other object of worship. I mention this as Mr. James Fergusson in a note on Buddhist structures, appended to Yule's Narrative of the Mission to the Court of Ava in 1855, appears to suppose that in Burmese monasteries "a dagoba altar" has been introduced, together with images of Buddha, thus converting the Vihara or monastery into the purposes of a chaitya hall. I am not quite sure that I understand what is meant by a "dagoba altar," to which "the priest turns in prayer." If it be a small model dagoba representing a relic receptacle, I am very certain I never saw one in a modern Burmese kyoung or monastery. In Burmah, Buddhist monks do not conduct worship. They simply preach the law. Each individual makes his own offerings, and utters his own ejaculations. Prayer is scarcely an appropriate term for the devotions of Buddhists. There was no indication in the ancient monastery I have been describing that any such object of worship as a "dagoba altar" was introduced. But in the enclosure wall of the monastery, and entirely detached from the building, are two small chambered or vaulted pagodas, which evidently were intended as oratories, (so to speak,) for the monks. This also would tend to show that no "dagoba" was placed within the walls of the monastery itself.

It may be well to add a few words on modern monasteries in Burmah. They are almost invariably built entirely of teak wood. Indeed Burmese of the present day, clergy and laity, appear to have

PLAN OF A MODERN

BUDHIST MONASTERY

at PUGAN.



SCALE 20′ = 1 INCH

a prejudice against living in brick edifices, whether sacred or profane. Close to the Ananda temple at Pu-gân is a monastery called Ananda monastery. It was, when I visited it in October, 1859, about eight years old. The building, of which a plan is annexed, rests on a platform of teak plank, supported by about two hundred massive teak posts, each not less than eighteen inches in diameter. The floor or platform is raised about eight feet from the ground. The monastery itself is 60 feet long from east to west and 45 feet from north to south. The outer portion of the platform on which the building rests, is left unroofed, being an open space from 14 to 16 feet broad, all round the monastery. A reference to the accompanying ground plan will show, that the arrangement of this modern building bears no resemblance to that of the ancient one. The outer walls of teak plank, are seven feet high. The roof rises with three gradations or tiers. The eaves, gables and ridge ornaments are elaborately and beautifully carved. No gilding appears in the building. The Abbot of this establishment was upwards of eighty years of age. His apartment would properly have been the state room (No. 4) but his great age rendered it irksome to him to move, so he passed his time, during the day, in the long northern apartment, (No. 2) half reclined, leaning against one of the great pillars and enjoying the air. About half of the north side of the outer wall of the building and the whole of the eastern side consisted of shutters working on hinges, which could be raised up and supported on poles, or closed at pleasure, usually only those on the northern side were kept raised during the day. At night the aged Abbot had his bed on the floor, near to where he sat during the day, though there was a handsomely carved bedstead for him close by, had he wished to use it. Near him slept one of the two pazens or deacons, of whom two were attached to the monastery. This arrangement also was with reference to the great age of the Abbot. Under ordinary circumstances, one or both of these pazens would have occupied the room south of the state room (No. 5). The long room called western apartment (No. 6) I found occupied by one of the pazens and the young probationers, of whom there were some half dozen. Usually also this would have been the school room for those boys who attended daily for instruction, but the old Abbot could not bear the noise of these youngsters, and the

schooling went on in another and separate building. In the idol apartment (No. 3), most of the images of Buddha were arranged facing the entrance, that is to the north. Two or three were facing the east. They were placed in wooden models of sacred dwellings, elaborately carved and gorgeously gilded. Worshippers coming to listen to the preaching of the monks, or to make offerings of flowers and food to the images, would kneel below the raised dais, and women probably outside the raised screens on the uncovered platform, so as not to come too near the officiating monk. But they might enter the monastery to deposit their offerings, on a receptacle which is generally placed before the images. No particular room was set apart as a library. Some book-cases were in the idol room, and some books were scattered on bedsteads below the dais on the east side.

In this monastery the discipline was evidently very lax, no doubt arising from the great age of the Abbot, and his inability to move about, and personally exercise authority. The pazens or deacons I found importunate, and the young probationers, notwithstanding their shaven heads and yellow robes, as riotous and wild as school boys. However they all were civil and obliging and willingly showed me over the establishment. Being much interrupted by them in making measurements of the rooms, I left it to be done by a Burmese assistant. He afterwards told me he also had been quite perplexed by the talking, questioning, joking and laughing of these young candidates for monasticism.

On the same platform with the monastery, and at a distance of only 13 feet under a separate roof was what is called a "phra kyoung' or image monastery. In this were images of Buddha placed facing to the north. But as this building is not an essential part of a monastery though in modem times generally added thereto, it need not be described.

References to plan of modern monastery.

1. Uncovered portion of the platform on which the building rests.

2. Outer hall extending on three sides of the building. The east side and a portion of the north is enclosed by wooden shutters.

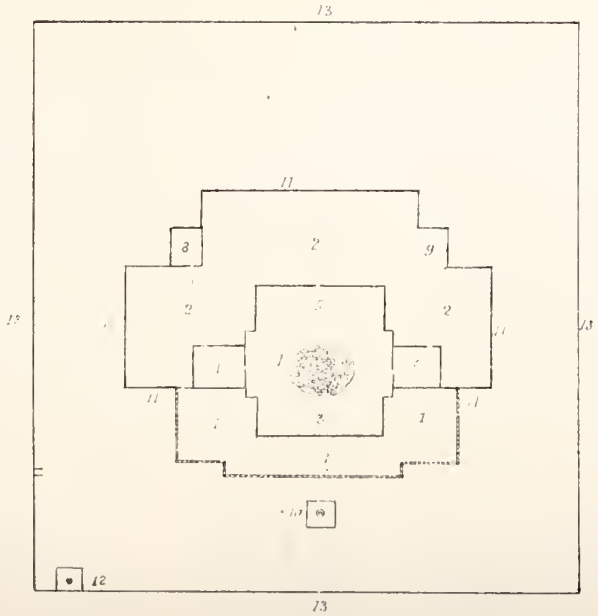
3. The principal division of the monastery called "Phŕa Khan,"

PLAN OF A RUINED

BUDHIST MONASTERY

near the Tsoola Moonee Pagoda

at PUGÁN.



REFERENCES

1. Open terrace
2. Court yard
3, 4 & 5. Apartments
7. Mound of ruins, apparently plain for an image, probably facing to the East
8. Vaulted Chamber (Library?)
9. Ruins of a look out tower
10. Small pagoda.
11. Inner enclosure wall
12. Small pagoda.
13. Outer wall.

or " Image apartment." The floor is raised about a foot higher than the rest of the floor of the building. The idols are facing the north and east.

4. The state room for the Abbot. This is separated by a richly panneled wall from the " Image apartment."

5. Room for the pazeng or second in rank to the Abbot.

6. The " western apartment," where the young probationers and students sleep and eat. In this apartment, ordinarily the teaching of the day-scholars would be conducted.

7. This is called " the Image monastery." It is not invariably joined to a monastery, but when added it is always on the east side. The principal idol in this building faces the north.

Note on a ruined monastery near the Tsoola Moonee Pagoda at Pu-gân.

Amidst the extensive ruins of Pugân there are probably many objects of interest yet to be discovered. I met with a second ruined monastery near an ancient temple called the " Tsoola Moonee." A rough ground plan which is annexed, shows the arrangement of the building. The main building, as seen in front facing the east, which included a portion of the interior enclosure wall, was nearly 150 feet long. The principal entrance was on the east. It was gained by ascending a slightly elevated open terrace. In the interior were four apartments, including the vestibule, which were arranged somewhat in the form of a cross, round a central mound, which had probably contained an image of Buddha, within a vaulted chamber. Not far from this monastery was another building, within which I found a stone inscription on which the Burmese date 678 (A. D. 1316) was legible, but I have not been able to decipher the inscription itself.

On the rocks of the Damúda group, and their associates in Eastern and Central India, as illustrated by the re-examination of the Ráni-ganj field.—By W. T. Blanford, *Esq. Geological Survey of India.*

One of the most interesting problems in Indian Geology is the question of the age and mutual relations of the rocks containing coal in Bengal and Orissa. The fossils from the first named locality have long attracted notice in consequence of the great divergence shewn by them from European types of carboniferous vegetation, and of their identity with those from beds, also containing coal, in Australia. But these fossils being entirely vegetable, and fossil plants not having attracted, until very recently, the attention they deserved, except in the case of the true carboniferous flora of Europe and America, very little progress had been made towards ascertaining the geological relations of the Indian coal fields, until the commencement of the work of the Geological Survey of Mr. Williams. They were almost universally massed together as representatives of the carboniferous era, and the details of their geology were utterly unknown. They had not even received the attention which had been devoted to the rocks of Central, Western and Southern India.

Mr. Williams directed his attention rather to the economical than to the scientific questions presented to him, and he appears, in his examination of the Rániganj field, not only to have accepted the idea of the rocks being of true carboniferous age, but to have supposed that he found in the several beds composing them, representatives of the subdivisions recognized in Great Britain. But his observations on the geological relations of the beds among themselves are generally careful and accurate, his map is singularly correct, considering the very grave difficulties under which he worked, and although, partly perhaps owing to the small area which came under his observation, many essential circumstances escaped his notice, his accurate and trustworthy descriptions have since proved most valuable in shewing the relations of the rocks he surveyed to others which have since been examined.

The only other detailed geological observations are contained in

two papers by Mr. J. Homfray, one published in the Asiatic Society's Journal for 1842, the other published in 1847, and reports by Dr. McClelland, on the Kaharbali coal field, and on other portions of the tract of country between the Ganges and the Grand Trunk Road. It is impossible to consider any of these papers as contributions to science, all being extremely inaccurate. Indeed in one case injury has been done, the plates attached to Dr. McClelland's report, not being true delineations of the fossils they are intended to represent (a result perhaps of the difficulty of obtaining competent draughtsmen and lithographers in Calcutta) have caused erroneous opinions to be entertained in Europe, amongst Paleontologists, concerning the affinities of the plants figured.

Very little light came from Australia. The plants there associated with the coal were examined by Messrs. Morris and McCoy, and the rocks themselves by Clarke and Strzelecki. Unfortunately the last observers adopted different and irreconcileable opinions, the first named stating that the coal-bearing rocks were interstratified with others containing marine shells of carboniferous age, the other that they rested upon the marine beds. The relations of the plants were generally considered to be oolitic.

This last opinion was supported by the discovery in India of cycadaceous plants, as Zamites, Pterophyllum, &c., allied to forms supposed, until recently, to be characteristic of Jurassic and Upper Mesozoic rocks. These Cycads were moreover in places, as in Nagpúr and the Rájmahál hills, found in the neighbourhood of Vertebraria, Glossopteris, and other genera, peculiar to the coal-bearing rocks, and it was supposed that all were found in the same beds.

The examination of the beds of the Rájmahál hills, of Orissa, and of Central India, by the Geological Survey, together with the valuable observations and collections of the Rev. Mr. Hislop at Nagpúr, have, for some years past, been gradually throwing light upon the true relations of the various beds. The re-examination of the Rániganj or Damúda field during the past two years has supplied several important links in the chain of evidence, and the following is an abstract of the views of the writer upon the classification which may be adopted. The details of the survey of the Rániganj field will be published as usual as the memoirs of the Geological Survey.

The rocks of the Rániganj field and their approximate thickness in feet, are, in descending order,

1.—Panchit group,.....	Upper Panchits, ...	500
	Lower Panchits, ...	1,500
2.—Damúda group, ...	Rániganj series, ...	5,000
	Iron stones, ...	1,500
	Lower Damúdas, ...	2,000
3.—Talchir group, ...	... ...	800
		11,300

Of these beds the Damúda group alone contains coal. This enormous thickness of beds is cut off on the south by a fault, *the downthrow of which cannot be less than* 10,000 *to* 11,000 *feet.*

The lowest or Talchir group, first separated in 1856 from observations in Orissa, consists of a series of fine sandstones and mudstones, frequently of a peculiar greenish colour, and becoming coarser towards the top, while towards the base they are commonly composed of the finest silt, in which there occur, in patches, gneiss boulders of enormous size, some having been measured as much as 15 feet in diameter. It is most difficult to account for so anomalous an occurrence as that of these huge blocks in the finest mud, for any current which could roll or even move the former would necessarily sweep away the latter, and although such a phenomenon appears absurd in India, judging from the climate of the present day, the action of ice, probably of the form known as ground ice, appears to be the only geological agent which can account for all the circumstances, by explaining the transport of the boulders.

The Talchir group had not undergone a very great amount of denudation, prior to the deposition of the Damúda rocks. It is, however, completely overlapped in the eastern portion of the Rániganj field, although well developed in the west. Very few fossils have as yet been obtained from these beds, those found are entirely plants, and shew distinctions from Damúda forms.

Beds belonging to the Talchir group have now been discovered in Orissa, in Central India, in Beerbhoom, where they occur in numerous scattered patches, and in one or two places on the west side of the

Rajmahál hills, besides their occurrence in the fields of Rániganj and Rámghar.

The Damúda series, thus named from its extensive development on the banks of the river Damúda, comprises, with perhaps one exception, all those rocks from which coal has been obtained in Bengal; the coal bearing rocks of the Himalaya, Khasi hills and Burma being, however, distinct. This series is divided in the Rániganj field by a mass of black shales, containing beds of clay ironstone, and attaining a total thickness of about 1,500 feet. There is evidence of unconformity between these shales and the Lower Damúdas, but none is clearly made out between them and the upper series or Rániganj beds, with which they are in consequence classed.

The Upper Damúdas of Rániganj must be carefully distinguished from those beds in Central India which have been called Upper Damúdas,* Mem. Geol. Survey of India, Vol II. pp. 176, 312. The Rániganj beds differ from the Lower Damúdas in mineral character, and also slightly, so far as is at present known, in fossil remains. The upper beds consist mainly of very thick false bedded sandstones, with seams of coal frequently continuous over considerable areas. The lower beds are much coarser and more conglomeritic, and are rarely false-bedded; their coal seams are numerous, but very variable in quality, and frequently thin out, or change into shale, or even sandstone, within very short distances.

The most characteristic fossil distinction between the two groups consists in the abundance of a species of plant referred by Mr. Oldham to Schizonema, in the upper division, which has not been found in the lower. No animal remains have as yet been discovered in the Damúda beds.

The upper or Rániganj series is not known to be represented beyond the Damúda field. The lower group is also found in Orissa, and along the Western side of the Rájmahál hills. The superiority of the coal of Rániganj is perhaps partly explained by the circum-

* This name was given for good geological reasons, as will be seen by reference to Vol. II. of the Memoirs of the Geological Survey. It has however proved an unfortunate appellation, as it conveys an incorrect idea of the relations of the beds, which contain a flora completely distinct from that of the true Damúdas. *see* Mem. Geol. Survey, Vol II. p. 176.

stance that most of the best seams occur in a group of rocks unrepresented in other fields. It is not known to which group the beds of Palámo Rámghar or* Central India belong.

Above the Damúda beds, and slightly unconformable upon them, occurs a series of coarse false bedded sandstones, with intercalations of red and grey clays, passing into shale in places. These beds are mainly developed in the Southern portion of the Rániganj field, where they form the mass of the fine hill of Panchit (Pachete), whence the name of Panchit series is suggested for them. The upper part of Panchit Behárináth and Garanji hills are composed of a coarse conglomerate, differing in mineral character from the lower portion of the formation.

This lower portion is of considerable interest, for, besides plants, the first distinct animal remains yet discovered in Bengal have been procured from them. These consist of various biconcave vertebræ and other bones, jaws and teeth, apparently reptilian, and of a small crustacean allied to Æstheria. The plants include, besides numerous peculiar forms, the Schizonema? so characteristic of the Rániganj series.

The Æstherias appear identical with those found by Mr. Hislop in the Mangáli shales of Nagpúr. From these shales was also procured a reptile, Brachiops latieeps of Owen, belonging to the same group as the Labyrinthodon. It seems probable that the Mangáli shales are the representatives of the Panchits of Bengal. The Upper Damúdas of Jabbalpúr may also be of the same age.

In the Rájmahál hills the Lower Damúdas are unconformably overlaid by a series of grits, conglomerates, and white clays. Above these, also unconformably, occur enormous flows of basaltic trap, with interstratifications of white and black shales, abounding in plants of the genera Zamites, Pterophyllum, Pecopteris, Tœniopteris, &c.

* Beds containing plants of Damúda age occur also at the base of the Himalayas of Sikkim, a circumstance first noted by Dr. Hooker, in his "Himalayan Journals," Vol. I. p. 403, and confirmed by myself in 1856. Nothing however could be made out of the extent of the beds, which are distinct from those containing coal on the Tista river. The only evidence of the existence of Damúdas were specimens of glossopteris and vertebraria *found in loose blocks* in a stream below Pankábári.

all quite distinct from Damúda forms. These beds were first accurately described by Professor Oldham in a paper published in the Society's Journal for the year 1853. They have since been named by him the Rájmahál series. It was, however, at first thought that a slight passage existed between the Damúda and Rájmahál groups, a view which Professor Oldham has since announced to be erroneous; the passage, if any exists, occurring in the conglomerates and grits interposed between the two series. Memoirs of Geological Survey of India, Vol. II. pp. 313, 325.

The conglomerates and grits of Panchit hill, provisionally termed the Upper Panchits, agree perfectly in mineral characters with those underlying the traps in the Rájmahál hills. As there is every probability that they occupy the same position in the general series, it is not unreasonable to suppose that they are an extension of the same beds.

A still higher group occurs in Orissa and in Central India, to which the name of Máhádeva has been given. No representatives of it are known in Bengal, and it is possibly considerably higher in the series than any of the groups above mentioned.* It is not by any

* Professor Oldham has suggested as probable that it is of Nummulitic (Middle Eocene) age. (Mem. of the Geological Survey of India, Vol. I. p. 171 and Vol. II. p. 210 note), and there are doubtless arguments in favor of his suggestion. But the Máhádevas are in Central India overlaid unconformably by an intertrappean series abounding in a shell, Physa Prinsepii, said to be very closely allied to Physa Nummulitica of D'Archiac from the Nummulitic rocks of the Panjáb, if not identical with it. (See Hislop on the Tertiary beds and fossils of Nagpúr, Quarterly Journal, Geological Society, Vol. XVI. pp. 163, 164). By D'Orbigny (Prodrome de Paléontologie, II. 299) Physa Prinsepii was considered identical with P. Gigantea, Du Boissy, from beds near Rheims which are of the lowest Eocene age, even below the plastic clay, while Nummulitic rocks are considered by the best authors on the subject, as, at lowest, middle Eocene. There is much general similarity of facies between the fresh water (? land) shells of the Rheims beds (Mem. de la Societé Geologique de France 2e. serie, Tome II. plate 6) and those of the intertrappeans of Central India. The identifications of the Physas are dubious, especially that of D'Orbigny, but the resemblance of the facies is important. So far as this evidence goes, it tends to point out the intertrappean beds as at least as low in the series as the Nummulitics and possibly lower. In this event, from the great break between the intertrappeans and the Máhádevas the latter must, a fortiori, be of pre-Nummulitic date. But all the evidence either way is of an extremely slight description.

means certain that the beds of Orissa and Central India are of the same age.

The age of the rocks associated with the coal of Bengal is still undecided, but it is to be hoped that the examination of the reptilian remains from the Panchit beds may throw some light upon the question. The occurrence of the little Æstheria, a crustacean singularly abundant in the Trias of England and Germany, the coal field (Lower Mesozoic and probably Triassic) of Richmond, Virginia, U. S., and in Nagpúr in connexion with a reptile belonging to a group peculiar to the Trassic and Permian periods, (Rupert Jones on Æstheria Minuta, Quarterly Journal, Geological Society, XII.) seems to add weight to the gradually accumulating evidence in favor of these beds being classed with the still imperfectly known groups which are considered by European geologists to form the close of the Palæozoic and the commencement of the Mesozoic epochs. (See Professor Oldham's paper on the geological relations and probable geological age of the several systems of rocks in Central India and Bengal. Mem. Geological Survey of India, Vol. II. p. 295.)

There are three localities whence more accurate determination of the age of these rocks may be expected. Of these one is in Australia, the other two in India, on the banks of the Godavery, S. of Nagpur and in Cutch; and the attention of all interested on the Geology of India should be directed to the desirability of obtaining all possible accurate information from these places.

The following diagram represents the views above put forward of the relations of the different series referred to together with their distribution throughout Eastern and Central India.

	Rániganj.	*Rájmahál.*	*Orissa.*	*Nurbadda valley.*	*Nagpúr.*
1.	„	„	Máhádevas ?	Máhádevas. Lametas.	Máhádevas.
2.	„	Rájmaháls.	„	„	„
3.	Upper Panchits.	Conglomerates.		Upper Damúdas of Jubbulpúr.	Mangáli shales.
	Lower do.	„			
4.	Rániganj series.	„	„	?	Damúdas.
	Iron stones.				
	Lower Damúdas.	Lr. Dms.		Lr. Dms. Lr. Dms.	
5.	Talchirs.	Talchirs.		Talchirs. Talchirs.	?

Report on Geological Specimens from the Persian Gulf, &c., collected by Captain C. G. Constable, H. M. I. N. *Concluding portion by* H. J. Carter, *Esq.*, F. R. S.

Since my Report on the Geological specimens brought to me by Captain Constable from the Persian Gulf was published,* Captain Constable and his assistant Lieutenant Stiffe have been back to the Gulf to finish their survey, and, having again returned to Bombay with the necessary observations for completing their Chart, have, at the same time, brought geological specimens from the islands which they had not before visited.

It will be remembered that the specimens first brought were chiefly from the islands at the entrance and on the Persian side of the Gulf. Those which I have now received are from the islands on the Arabian side, and which, with Captain Constable's account of the Artesian Springs about Bahreyn, and the occurrence of floating tracts of Naphtha a little higher up, will now successively occupy our attention.

After having entered the Persian Gulf and keeping on the Arabian side of the islands of Boo Moosa and Surree,† whose geology has been mentioned in my last "Report," we come, bearing S. S. W., about 45 miles from the latter, to the island of Seir Abonade, rising 240 feet above the level of the sea at its highest point, whose geology is illustrated by volcanic trappean rock and red ferruginous gypsum, similar to that of the nearest island, viz. Surree, which thus connects Seir Abonade with the volcanic formations of the whole of the islands on the Persian side and extends these formations on to the islands on the Arabian coast, with which we are now principally concerned.

Taking thence a W. by S. course and running along the border of the "Great Pearl Bank," which presents nowhere more than ten fathoms of water over it, and shoals off to the Arabian coast, we

* For the former portion *vide* Bengal Asiatic Journal, No. 97, p. 41. (New Series).

† I must here follow the Orthography of the Charts. "Boo Moosa" and "Surree" would certainly be better spelt "Bu Musa" and "Sarri" for European pronunciation generally.

cross over its seaward margin, and at 70 miles from the last mentioned island, arrive at those of Zírkúh, Daus, and Jirnain, after which, a few miles west, come the islands of Arzenie, Daeny, and Dalmy, which latter lie respectively, N.W. and S. W. of the former.

The island of Zírkúh, which rises 540 feet above the level of the sea, and is by far the highest in the two groups, presents not merely remnants, but an exact geological type of the islands on the Persian side, viz. volcanic rock capped with "Milliolite,"* together with altered shale and specular iron-ore.

Of the same type, also are Daus and Jirnain, but *without* the Milliolite.

In the next group, the island of Dalmy, which is 244 feet in its highest part, and only 25 miles from the Arabian coast, we find again the same kind of volcanic and marine formations; thus carrying them on to within a few miles of the mainland, on which there are no doubt points, here and there, where they might be equally well verified, and thus completely extended from one side to the other, of the lower part of the Persian Gulf. Some of the specimens of "peacoek-iron-ore" from Dalmy are as beautiful as any that I have ever seen from the island of Elba.

The island of Arzenie is also composed of volcanic roek eapped with Milliolite, while that of Daeny which is only 9 feet above the water, consists of compact limestone altered by heat and also eapped with Milliolite, shewing at once the kind of strata through which the volcanic rock has been thrown up and that whieh has subsequently been deposited on it.

Lastly the little island of Hawlool, which is outside the "Great Pearl Bank," 180 feet high, and 45 miles north of the last mentioned, is again composed of volcanic rock capped with Milliolite, while the island of Yassart, which lies nearly south of the latter and within ten miles of the Arabian coast, presents the Milliolite alone, and thus, as far as our observations extend, disappears the voleanie rock from the southern-most part of the Persian Gulf.

Doubtless there are points, as before stated, on the mainland, here and there, where the volcanic rock projects above the surface, but

* For a deseription of this type and the "Milliolite," see my first "Report" *loc cit.*

with the exeeption of Jibel Allee lying E. S. E. of Seir Abonade, which is 220 feet high ; the island of Sir Beni Yas, and the headland close to it, which are respectively, 430 and 350 feet high ; Jibel Hadeed, about 85 miles futher west, and about 300 feet high, and a few other mounds much lower still, the whole of this shore is on a level almost with the sea, as far inland as the eye can reach, barren and uninhabited, shewing still further how the Gulf, in its lower half, shoals off through the "Great Pearl Bank" into the interior of the mainland of Arabia.

Leaving this field of volcanic disturbance, in which the outbursts of igneous rocks, here and there, have brought up with them the great field of rock-salt whose culminating point above water is in the island of Hormuz, (for all the others which present volcanic rock are thoroughly sodden with salt), we come, on rounding Ras Rekkan northward, to the island of Bahreyn, which at its northern part, presents an extensive area both above and below the sea, of freshwater springs, the artesian nature of which is at once established, by the rainless locality in the midst of which they are situated, and the approximation of the mountain chain on the opposite side of the Gulf, only 160 miles distant, whose strata raised to upwards of 5000 feet within a few miles of the sea on the Persian side, dip downwards to form the Gulf, and rising again, apparently without much disturbance, at Bahreyn, thus carry their waters with them to issue at a place much lower than that on which they fall. That the presence of these springs at Bahreyn may be thus explained needs only a reference to Captain Constable's beautiful chart, and, for the detail respecting them, here is his own account :—

"The freshwater springs in the sea about Bahreyn and on the island itself," Captain Constable states, "are numerous, and there are some to be found at intervals near the mainland of Arabia in the neighbourhood ; indeed I was informed by the Shekh of Manama that there is a lake of freshwater on the mainland close to the shore nearly opposite Bahreyn. They are to be found at intervals also as far north as the island of Bu Ali, but none beyond, nor are there any others at any other part of the Persian Gulf ; so that they are confined to this part, that is about 90 miles of the coast of Arabia.

"The old travellers who wrote of them, relate how the Arabs dived

down to a fresh spring under the sea in five fathoms of water and filled their jars returning with them to the surface. Such I take to be "travellers' tales." All the springs that I know of, (and between us, Lieuts. Whish, Stiffe, and myself, I think we visited most of them), were situated on the reefs, many of which with the reefs were left dry at low water.

"There is one about 10 miles N. W. of Manama (which is the name of the principal town of Bahreyn), close to which H. M. Schooner, "*Mahi*," anchored, and from it supplied herself with water. They took in 700 gallons of good sweet water from it in one day. The spring is about three feet under the sea, and the way they managed was by putting a tube into it, to which a short piece of hose was joined, and the water rising in the tube, was thus conveyed through the hose directly into the boat which lay along side, where it was received into casks which had been brought for the purpose, without further trouble.

"Again, there is the island of Maharag, close to the N. E. point of Bahreyn, on which is the large town of Maharag with six or seven villages, all of which obtain their freshwater from springs under the sea or nearly so, situated on the great reef which surrounds the island. At low tide the inhabitants walk out to them and fill their vessels. Proceeding round the island northwards, from Maharag, we first come to one of these springs, on a low flat, rocky islet opposite the village of Biseytin, where it is situated in a basin which purifies itself as the tide falls but is over-flown at high water. A mile further on, are three or four others of good sweet water, all of which are also covered at high tide. The inhabitants of the village of El Dír obtain their supply entirely from these. Further round the island still and opposite the village of Gallali are two more springs on the reef; in these we found that the Arabs had placed bamboos, through which the water was bubbling up; there are also the remains of a building here, in the sea, but on the reef close to the springs. Still further round about a mile or two to the south, on the reef, is a slab of rock called "Bú Shahin" where there are more fresh springs. Then a short distance S. E. of the fort of Maharag is another, still under the sea, at least at high water, it is called "Bú Mahah." Beside it is an old tower and it supplies Maharag chiefly. Thus the island on which

Maharag is situated is surrounded by freshwater springs which, as before stated, are over-flown at high-water; and in addition to these there are others which bubble up through the island itself.

"There are also many which issue through the northern part of the island of Bahreyn, but they appear to be confined to this part of the island and are not found southward.

"I regret that I had not an opportunity of getting geological specimens of the island of Bahreyn, the highest point of which is about 400 feet above the level of the sea.

"Reverting to the spring from which the "*Mahi*" was supplied with water, I would add that, besides being 10 miles from Manama, it is 7 miles also from the nearest land which is the N. W. point of the island of Bahreyn. There is a snug anchorage close to it in a bight between reefs; the place is called 'Khor Fusht,' and a vessel lying there is sheltered from all winds. It has this convenience, viz. that the water is deep close to the reef, so that a vessel can lie close to the spring. The difficulty, however, is to find the spring, because even at low water, there is from 2 to 3 feet over it.

"Lastly about 30 miles N. W. of Bahreyn, near Al Katif, is a small island called 'Deman,' five miles off which, in the sea, is another freshwater spring on a point of the reef called 'Rasal Khali,' it has also three feet of sea over it at low tide."

Having thus added what Captain Constable has kindly given me respecting the "freshwater area" as it may be termed, of the Persian Gulf, let us proceed still northward to the head of the Gulf, keeping on the Arabian side, and the first islands that we pass are those of El Kran, Arabi, Farsi and Hurgooz, which in my last report I have stated to be composed of limestone-gravel milliolite, and still further northward we come to those of Om el Maradim, Garu, and Kubbar, of which the geological specimens now before me give the same composition.

But the point of most interest communicated to me by Captain Constable respecting this part of the Gulf, is that of his having sailed through two floating tracts of Naphtha here at different intervals, respectively close to the two groups of islands last mentioned, making this, as it were, the "Naphtha area" of the Gulf. Of these phenomena Captain Constable states as follows:—

"Near Busra is a place called by the Arabs "Om Gheir"or "the place of bitumen;" and close to the town of Koweyt, at the head of the Persian Gulf, is another on the sea-shore called "Benaid el Qár" or "bitumen dyke;" while up at this part of the Gulf I have reason to think that there are also springs of it under the sea, for in August 1843, when in a ship 12 miles N. N. E. of the little island called "Farsi," we passed through a field of it. The surface of the sea was covered with a glairy, oily looking substance which was accompanied by a strong smell of Naphtha.

"Again in October 1859, while sailing from the little island of Kubbar to another close by called Garu, we experienced a strong smell of Naphtha, and presently passed through large sheets of oily substance floating on the surface of the sea. Our Arab Pilot whom I had engaged at Koweyt said that this appearance was by no means uncommon, and that he was certain there were springs of it near this part, and that he knew where to take his boat to collect it, but he did not know how to collect it or he could make a fortune by it."

The last addition to our geological information made by Captain Constable is that obtained from his specimens of the Dehmaniyah group of islands which lie close to the shore a few miles west of Muscat, all of which are formed of limestone like that of the eocene strata of the adjacent coast, while a specimen of old diorite from Khor Fakn, 165 miles further up towards the Persian Gulf, is also of the same kind as that of Muscat.

As regards the heights of the mountainous range called Jebal Akdthur whose extreme summit inland, as seen from the sea close to Muscat, I had judged to be about 6,000 feet,* Captain Constable by triangulation makes this 43 miles inland and 9,900 feet above the level of the sea. The highest point near Ras Mussandum, 6700 feet, and Jebel Bees, a mountain about 25 miles inland on the Mekran coast opposite, stated at a guess in my last "report" to be from 5 to 6,000 feet, is now made by triangulation, to be only 4,600 feet above the sea; but there are points which lie inland to the northward of Bunder Abbas, respectively, 20, and 30, and 45 miles distant, 7,600,

* Geology of the S. E. coast of Arabia in my "Geological Papers on Western India," p. 555.—*Ib.* 532.

and 8,500, and 10,660 feet high, all which, from Bunder Abbas belonging to the Imam of Museat, and the willingness of the Museat Arabs at this place to accompany travellers to them, according to Captain Constable's account, might be easily visited. The highest point is in 27° 50′ N. L. inland. At the head of the Persian Gulf, 45 miles N. E. of the village of Delim and 75 miles N. E. of Bushire, are two other points, respectively 10,900 and 10,200 feet above the sea; and between this and the last mentioned mountain at the other end of the Gulf, are points in many places varying from 2,000 to 5,000 feet high, many also of which are almost close to the coast. Thus does the Persian differ from the Arabian side of the Gulf, which latter we have seen to be almost on a level with the sea.

With this, ends all that I have to state from Captain Constable's information and specimens, respecting the geology of the Persian Gulf, which a previous personal knowledge of the coast of Arabia and Capt. Constable's accuracy have enabled me to use as I have done. Captain Constable has now finished his beautiful chart of the Persian Gulf and has handed it in to Government, and with the completion of this work my supply of geological information from this interesting locality ceases; which I regret, as one regrets the cessation of a flow of conversation on a favourite subject from a friend in whose communications one has every reason to place the greatest confidence.

Perhaps there is no part of the world which presents such a succession of striking phenomena as that between Mekran and Mesopotamia inclusive,—beginning with the great area of mud volcanoes in the former, in which the cones range from nothing to upwards of 712 feet high;* and then going round by the Persian Gulf, at whose entrance is an area of rock-salt culminating in the island of Hormuz; then the sieve-like state of the earth in and about the island of Bahreyn occupying the middle of the Gulf—the "freshwater area;" and lastly the "area of Naphtha springs," at the head of the Gulf and in the vale of Mesopotamia; all of which are in connection with the great fault and anticlinal axis which bounds on the south-west and south respectively, the highland of Persia, Karmania, and Mekran.

* See Captain Robertson's interesting and valuable "Memoir"—Journal of the Bombay Asiatic Society. Vol III. part 2nd, p. 8, 1850.

Notes upon some remarkable Waterspouts seen in Bengal between the years 1852 *and* 1860.—*By* Major Walter Stanhope Sherwill. —*Boundary Commissioner,—F. G. S.; F. R. G. S.*

During several years in which I have been engaged in recording remarkable atmospherical phenomena in Bengal, I have witnessed the formation and dispersion of several very remarkable waterspouts in and near Calcutta; of these natural bodies I have made a memo. that describes the dates, appearance, times of duration, size, and direction of translation of these remarkable natural phenomena, in the hope, that it may assist any future enquiries that may be instituted into the nature of the laws regulating these bodies; for up to the present time no satisfactory theory has been advanced that serves to connect these phenomena with the general law of physics.

Electricity, doubtless, is the grand mover in the formation, action and dispersion of waterspouts, but its mode of action has not yet been satisfactorily analyzed. These columns are composed of dense masses of vesicular vapours similar to heavy storm, or rain clouds, some portion of the column has generally a violent gyratory motion as well as a motion of translation. Those seen near Calcutta have all been long, slender columns about 1000 feet in length, of a pale blue colour, dark at the edges and pale in the middle; this appearance indicates them to be solid columns of vapour; a glass rod held up to the light would present the same appearance, as would also a barometer glass tube filled with water, or a human hair which is a tube filled with liquid, or any similar object that possesses transparency.

In many cases waterspouts are accompanied by thunder and lightning, balls of fire, or great noise, they uproot trees, destroy cultivation, overturn hayricks and houses, exhaust tanks of their water, drawing up the fish at the same time, showering them down upon dry land and on the tops of houses miles away from the spot from whence taken up: but of the waterspouts mentioned in these notes, not one did any harm or the slightest damage, most of them were dissipated into heavy rain, or were absorbed upwards into the clouds without effecting any contact with the ground. Only one, that seen over Howrah, was accompanied with lightning and thunder. No one waterspout

was accompanied with hail, which often does accompany the dispersion of waterspouts; no one drew any water or other substances upwards, as is the case when waterspouts are formed at sea. The general length of the waterspouts seen, were a thousand feet, one however was 400 feet and another 1500, in length.

It will be remarked that those waterspouts seen near Calcutta took place during the later months of the wet or south-west monsoon, August, September, and October.

That electricity is the grand mover of these bodies I think is evidenced by waterspouts being more general in dead calms than in windy weather; the suddenness of their formation; their instantaneous dispersion when once the condensation of their vapour commences, their violent and rapid gyratory motion; their great power of destructiveness although no wind may accompany them, their peculiarity of tearing trees into dry shreds in a precisely similar manner, as a tree struck by lightning is torn and dried by the evaporisation of all particles of sap from excessive heat; the violent electrical discharges, balls of fire and hail that oftentimes accompany them; and the fact that their presence in no way affects the barometrical readings of the moment.

The favourite theory regarding the formation of these phenomena is simply, that when the electrical tension of the clouds is very intense, the powerful action that arises from this state of tension causes the cloud to lower itself towards the earth, for the purpose of discharging its electricity; this sudden rush of the cloud and its contained electricity towards the earth together, compose the waterspout: during their descent, from some unknown cause, a violent gyratory motion takes place, light substances are attracted upwards, and those whose weight prevents their leaving the earth, such as trees, houses, haystacks, &c., are torn and shreded to pieces; should the waterspout meet with water, it is immediately entangled in the gyratory motion and drawn upwards, as was the case some years ago at Cuttack, where numbers of small frogs and fish, drawn up with the water from a tank, were precipitated from the clouds and were collected alive from the roofs of the houses in the station.

Man has learnt, in a great measure, to disarm the lightning of its dangerous power; he has learnt how to avoid and not only to avoid,

but he has also learnt how to make use of for his own purposes one of the most fearful and hitherto ungovernable and tremendous natural phenomena, the cyclone: meeting at sea with this violent and formerly much dreaded wind, the intelligent sailor boldly sets his sails to meet it, and by his intelligence and foresight makes what might, in his ignorance, have been his destruction, a fair and a favorable wind to help him on his way to his desired haven; or else, laying to, he bows to the storm and patiently allows it to pass on its way, resuming his journey when it has passed. And so it should be with waterspouts, to thoroughly search out, and to understand the laws that govern these impetuous columns would not only be satisfactory to science, but might be the means of affording some protection to those who are liable to be harmed by them; mankind possessing this knowledge might be able to disarm these columns of their power of uprooting trees, overturning houses, sinking small vessels, disabling others, of demolishing valuable plantations and cultivation, and carrying destruction in their path; but our knowledge concerning waterspouts, as it at present stands, allows these phenomena full power to do as they please.

The formation, action and dispersion of the waterspouts observed, being very similar, I proceed to detail the above appearances in a very grand waterspout that occurred within $1\frac{1}{4}$ miles of my house, merely observing, that there appear to be only two methods for their dispersion, namely either by precipitation of vapour to the earth as heavy rain; or absorption upwards as vapour into the clouds.

On the 7th October, 1859, a waterspout of colossal dimensions was seen to form and burst at Dum Dum 8 miles north-east of Calcutta. (See plate I. and plate II. fig 3.)

The observations made upon this phenomena at the time are as follows:—

The south-west monsoon had, during the week, received its first check by the north-east monsoon endeavouring to cross the Himalyah Mountains and to drive back the heavy masses of clouds and moisture that had been banked up along their flanks during the whole of the rainy season, or during the prevalence of the south-west monsoon.

At Dum Dum, the whole visible heavens were occupied by a dense

Plate 1

GREAT WATER SPOUT seen at DUM DUM (BENGAL) 7TH OCT 1859.

Plate 2

SKETCHES of SIX WATER SPOUTS seen in BENGAL, between the years 1855 and 1860.

ON STONE BY MAJOR W. S. SHERWILL, AND LITH BY H.M. SMITH, SURV GENL'S OFFICE, CALCUTTA 1860.

Plate 3.

A GROUP of TWENTY WATER SPOUTS seen in the HIMALAYAH MOUNTAINS, at an elevation of 10,000 feet, 1852.

ON STONE BY MAJOR W.S SHERWILL AND LITH BY H.M.SMITH, SURV GENL'S OFFICE, CALCUTTA, OCTOBER, 1860.

Plate 4

WATER SPOUTS seen at DUM DUM, 28 Sept 1860

ON STONE BY MAJOR A. S. SHERWILL, & LITH: BY H.M. SMITH, SURVEYOR'S OFFICE, CALCUTTA 1860.

mass of very grandly shaped and massively grouped strata of cumuli, at various elevations, the lowest from actual measurement was 2000 feet above the earth; the highest, probably reaching to 25,000; the whole mass being about 5 miles in vertical thickness.

The aspect of the heavens during the past few days had been most remarkable: presenting a scene of great atmospherical disturbance, the clouds evidently being impelled from the south by the south-west monsoon; but violently checked by the north-east monsoon, giving to the whole mass of clouds extending for as many miles as the eye could reach from north to south, and from east to west, a rotary and at the same time an undulatory motion; in fact causing huge tracts of clouds to revolve rapidly round a centre that appeared from my position to be about 5 miles to the south-east. This rotary motion performed in a very large circle gave the clouds the appearance of moving in two distinct directions, for the clouds nearest to my position appeared to be going to the north, and those furthest removed appeared to be going to the south.

There had been but little rain during the day; in the early portion of the day the wind had been from the south bringing with it a large body of clouds from the sea; at noon it changed to the south-west; and at 2 P. M. to the west and at 4 P. M. to the north.

It was between the hours of 3 and 4 P. M. that the greatest disturbance in the clouds took place; the whole mass revolving and heaving violently; extensive masses of clouds being crushed and driven into others but unattended by any electrical discharges. It now rained heavily to the north and east. It was during this time that more than one waterspout endeavoured to form, but unsuccessfully. It was whilst observing the highly agitated masses of clouds that were revolving and oscillating in a most peculiar manner, that I witnessed the commencement and termination of the remarkable waterspout now under consideration. At 3 P. M. it became suddenly quite calm and during the calm a pale watery-looking but very lofty cumulus, the base of which was a right line, and parallel to the horizon, was seen to bulge out downwards or towards the earth in a long well-defined and light-blue coloured outline; from the centre of this hanging curve a broad column of a pale watery vapour rapidly sank towards the earth, closely resembling a very attenuated cone, dark at the edges and pale blue

in the centre, plainly showing it to be a solid cylinder; as it neared the earth, the lower half of this elegant column commenced to gyrate rapidly, the lower end oscillating violently to the right and to the left; this latter movement I imagine to be a mere optical illusion, caused by the lower end of the column revolving in a circle of large diameter; as the column neared the earth it expanded and contracted in an agitated and rapid manner about the centre into cloud-like protuberances which partook at the same time of the motion of the revolving column.

Upon arriving nearer the earth, the end of the column parted into two slender columns about 150 feet each in length, and in this condition reached the ground.

The shape of the column was now completely and instantaneously altered; for the whole cumulus burst and was seen pouring down to the earth, not as a shower of rain but as a heavy mass of water, resembling a waterfall more than a shower of rain, that completely exhausted and brought the whole cloud to the ground in a few seconds of time.

The estimated height of the cumulus from its summit to its base was 5000 feet, and 3,000 feet in length, the whole of which mass of vapour was precipitated tumultuously and instantaneously to the ground in the shape of water.

The period of duration of the column from its first forming to its bursting, occupied about 25 seconds, and offered a very grand and imposing sight.

The mass of water so suddenly precipitated upon a large grassy plain, for the column burst upon the artillery practice ground, was simply to put half a square mile of country under water for about half a foot deep. This water took 14 days to drain off by the usual drainage courses of the country.

That the waterspout was accompanied by a noise I can hardly doubt, judging from the alarm exhibited by the cattle in its neighbourhood who fled in all directions as it descended. No noise was however heard from my position $1\frac{1}{4}$ mile distant.

By the assistance of a theodolite, a measured base, and observed marks upon the walls of my house, I was enabled to ascertain that the height of the waterspout from its junction with the clouds to its

lowest extreme point, at the moment of bursting was 1,500 perpendicular feet.

Half an hour after this waterspout had disappeared another formed to the east of my position; it was a very attenuated column about 900 or 1000 feet in length, but the cloud from whence it descended being upwards of 2000 feet above the earth, no contact was completed; the column which lasted for half an hour gradually faded away, being absorbed upwards into the cloud from whence it had descended. The cloud and column were moving rather rapidly towards the south, which probably accounts for the column never reaching the ground. The column gyrated and oscillated violently, lengthening and contracting as shown in the diagram, where eleven different positions of the column are given sketched at intervals of from 2 to 5 minutes.

Towards sunset, the clouds began to yield to the north-wind and were gradually driven out to sea, leaving a clear cloudless sky, and at 9 o'clock at night not a cloud was to be seen.

The north-east monsoon had fairly set in.

	inches
Barometer at the time 3 P. M.	29.796
Attached thermometer, ...	85°.8
Dry ditto, ...	86°.2
Wet ditto, ...	81°.8

List of Waterspouts seen in Calcutta and its vicinity, from the year 1852 *to* 1860.

Where seen from.	Date.	Length of Waterspouts.	Direction of movements.	Remarks.
1.—Sooksagur, 35 miles North of Calcutta.	27th Sept., 1855, 3.30 P. M.	1,000 feet not measured. Estimated	Moving to the South.	Depended from a heavy Nimbus at an angle of 45° with the horizon. Upper portion gyrated rapidly, lasted ten minutes, did not burst but was absorbed upwards. (See Plate II. fig 1.)
2.—Howrah (Calcutta.)	24th Sept., 1856, 6 P. M.	200 feet estimated.	Moving to the North.	Depended from a very heavy and stormy looking Nimbus. Lasted about five minutes, was greatly agitated, throwing its lower end horizontally to the South, then to the North at an angle of 45°; burst into heavy deluging rain. Vivid lightning accompanied the Nimbus. (See Plate II. fig 2, *a. b. c.*)
3.—Dum Dum, 8 miles North-East of Calcutta.	7th Oct., 1859, 3 P. M.	1,500 feet measured with a Theodolite.	Moving to S. E. Dead Calm.	Depended from heavy Nimbus, forming the lower end of a massive cumulus 5,000 feet in height; central portion revolving violently with cloud-like protuberances; lower end divided into two tails about 150 or 200 feet in length each. Lasted 25 seconds burst upon contact with the earth into heavy rain. Notes upon this Waterspout were read before the Asiatic Society in September, 1860. (See Plate II. fig 3.)
4.—Dum Dum, 8 miles North-East of Calcutta.	7th Oct., 1859. 3.30 P. M.	1,000 feet estimated.	Moving rapidly to the South.	Seen half an hour after the foregoing Waterspout had burst. Depending from a heavy cumulus 2,000 feet above the earth, did not burst. Was absorbed up into the clouds. Lasted half an hour. (See Plate II. fig 4; a group.)

5.—Dum Dum.	11th Augt., 1860, 5 P. M.	1,000 feet estimated.	Moving to the South.	This was a very perfect and grand Waterspout and was seen from Calcutta; it gyrated rapidly at the top of the column; depended from a heavy Nimbus; burst into heavy rain. Was divided at the lower end into two smaller columns of 50 or 80 feet in length. Lasted about ten minutes. Column dark at the edges and pale blue in the middle; no lightning accompanied it. (See Plate II. fig 5.)
6.—Sulkea, Calcutta.	11th Augt., 1860, 5 P. M.	8 or 900 feet estimated.	Moving to the North-West.	This Waterspout crossed the Hooghly at Sulkea (Calcutta) agitating the water beneath it. Depended from a heavy Nimbus, burst into heavy rain. Gyrated rapidly at the summit of the column. Was bent by a South wind into an elegant double curve resembling the letter S. Had hanging fringe-clouds, dropping rain, on the South side of the upper part of the column. Lasted about ten minutes. The upper portion of the column was absorbed upwards, the lower part fell in rain. (See Plate II. fig 6.)
7.—Darjiling in the Himalayah Mountains.	29th May, 1852, Noon.	20 Waterspouts 1,000 feet in length each.	Moving to the South.	The 29th May, 1852, was a warm, dry summer day, and had been highly favorable to evaporation, and though invisible to the eye, the air was charged with moisture, which suddenly showed itself in an extraordinary manner as a huge cumulus, fifteen miles in length, at an elevation of 11,000 feet, which was rapidly formed by the condensation of the invisible vapour caused by a chilled stream of air descending from the snowy range, distant thirty-five miles; the effect of this cold blast was first shown in the formation of a small cloud, the size of the hand, which rapidly increased until, as before described, it extended to fifteen miles in length

List of Waterspouts—(Continued.)

Where seen from.	Date.	Length of Waterspouts.	Direction of movement.	Remarks.
				and 5,000 feet in vertical thickness. This body of vapour was driven rapidly to the South, and as it approached the Mountain Tongloo, which rises to 10,009 feet above the sea, the lower portion of the cloud which had hitherto been Stratus, or nearly horizontal, began throwing down about twenty Waterspouts, each one thousand feet in length, which gyrated at a rapid pace, increasing in length at the same time, until the whole cloud burst into heavy rain. The distance of the Tongloo Mountain from the spot of observation, at Darjiling, was eleven and a half miles; the gyration of the tails or Waterspouts therefore must have been very rapid, and very extensive, to have enabled me to see it so plainly with the naked eye. The summit of the mountain was evidently a point of attraction for the electricity contained in the cloud, as the Waterspouts one mile North and South of the central group descended towards the mountain at an angle of 45° with the horizon, and all seem striving to reach the very summit of the mountain, and upon reaching it, they all burst into heavy rain. Time of duration fifteen minutes. (See Plate III.)
8.—Dum Dum.	28th Oct., 1860.	One central 1500 feet; and several small lateral Wa-	Moving to the West.	This extraordinary group was seen from Dum-Dum; sketched and described to me by the Rev. R. A. H. Norman. The group was composed of one central and

terspouts 500 feet each.						large Waterspout about 1,500 feet in length, flanked to the Eastward by many smaller Waterspouts that were absorbed into the main column as fast as they formed. Between the heavy Nimbus from which the Waterspout depended and the mass of light haze that covered the horizon, a long strip of blue sky was visible, the Waterspout where it crossed this strip was invisible, appearing as if divided into two portions. The whole group lasted 20 minutes and eventually burst into heavy rain.

Note on the Races of Rein Deer.—*By* Edward Blyth.

(*Concluded from page* 306.)

In a foot-note to p. 283, I briefly remarked on the races of Rein Deer, and stated that I would recur to the subject in the sequel.

Mr. Andrew Murray of Edinburgh has been engaged in investigating the question, whether the Rein Deer of Lapland differs from the barren-ground race of N. America, and he has figured what he assumes to be characteristic horns of each race, suspecting that the broad vertical plate into which the brow-antler commonly expands in the barren-ground Caribou, to be peculiar to that race (*Edin. New Ph. Journ.*, April, 1858). In a Lapland specimen, however, in the Society's museum, received from that of Christiania (and not improbably the head of a wild animal), the horns more nearly resemble the American horns figured by Mr. Murray; and I therefore greatly doubt his supposed distinction between the barren-ground Caribou and the *wild* Lapland Deer.

Referring also to the detailed notice of the wild Rein Deer of northern Scandinavia, in Mr. L. Lloyd's 'Scandinavian Adventures' (II, 193), I find that this author remarks (probably on the authority of Prof. Nilsson), that the horns of the *wild* Rein Deer of Europe "are large and slender, with brow-antlers *which are broad and palmated*." But the horns of the wild animal of arctic Europe would seem to be rare in museums; while those from America are exclusively the production of wild animals, and, as a rule, are undoubtedly picked specimens chosen from a considerable number. Hence, perhaps, the difference alleged or suggested by Mr. Murray. Moreover, in no other species of Deer are the horns so extraordinarily variable; wherefore, to arrive at a fair conclusion, it must be necessary to examine a considerable number of unselected horns of the wild animal from both regions.*

* The *Cervus coronatus* of Geoffroy was founded on a very remarkable pair, supposed by him to have belonged to a peculiar species of true Elk (or Moose)! *Vide* figure in Griffith's English edition of the *Règne Animal* (IV, 96), and also in Cuvier's *Ossemens Fossiles* together with a gradation of other horns referring them clearly to the Rein Deer: this curious pair consisting of broad palms without any beam, and dividing anteriorly into spillers.

It would appear that the wild Rein Deer of arctic and sub-arctic Scandinavia still exists in very considerable numbers. Thus Lloyd, quoting Prof. Nilsson, states that—"On the high fjälls in the vicinity of Röldahl and Woxlie, the Rein Deer collect at times in astonishing numbers. One day in the beginning of June, 1826 (a couple of months before my visit to this district), the fjäll, for the breadth of a Norwegian mile—which is a trifle more than seven English miles—was as thickly covered with Rein Deer as the ground is where Sheep feed in a flock. * * * The herd extended such a distance, that the eye could not embrace the whole at once. Subsequently the Deer separated into three divisions. * * * This reminds one as well of the interminable herds of Antelopes in the deserts of Africa, as of the equally large herds of Bisons in the prairies of America. * * * That this account is literally true, the Professor adds, is the more certain, because it was given him at different places and by different persons, who all agreed in their relations. The phenomenon excited a great deal of interest—no person having previously seen so large a number of Rein Deer collected in one and the same place. On the Jemtland and Herjeadalen mountains in Sweden, as well as in the north-eastern portion of Lapland up to the North Cape, [the wild] Rein Deer are also pretty abundant. But in the intermediate country, which with some propriety may be called Western Lapland, though formerly numerous, very few, according to Læstadius, are now to be found.

"The number of wild Rein Deer killed annually in Scandinavia, by one means or another, is considerable. Very many, to my knowledge, are shot on the Norwegian mountains by peasants and others; as also in the more northern part of the peninsula. One of my guides in Russian Lapland, who was much celebrated as a chasseur, assured me, indeed, that in his time he had destroyed hundreds of those animals—in one instance as many as nine in a single day. For the most part he had shot them during the autumn, when they were in the best condition: but many he had also run down on Skidor." There ought, therefore, to be no great difficulty in procuring fine horns of the wild European animal for museums.

"Of the tame Rein Deer of Lapland," continues Mr. Lloyd, "there are, so to speak, two kinds: the so-called *Fjäll Ren*, or moun-

tain Rein Deer, which for the greater part of the year are herded on such elevated regions as to be destitute, or nearly so, of arborea[l] vegetation; and the *Scogs Ren*, or forest Rein Deer, that all the year are pastured in the forests. The Skogs Ren is the larger of the two; but even he is much inferior in size and nobility of appearance to the wild Rein Deer. The latter is occasionally killed, weighing about 350 lbs.; whereas the tame Rein Deer, according to Swedish naturalists, never attain to more than 200 lbs.* The wild Rein Deer is of a much lighter and more handsome colour than the tame. His coat—in the winter at least—is immensely thick." (Lloyd's 'Scandinavian Adventures,' II, 190, 192, 198, 206.)

Another writer describes the wild Rein Deer of Scandinavia as "thinner, with more appearance of bone, and considerably stronger," than the tame; in fact, a more 'game'-looking animal, as is usually the case with species in a state of nature.

The object of these citations is to shew that the fossil Rein Deer of the British Islands may well be identical with the existing wild animal of Scandinavia, as distinguished from the tame kind, rather than of a race peculiar to the barren-grounds of arctic America (as has been suggested), which, however, I suspect to be one and the same particular race;† whereas the Musk Ox, likewise met with fossil in Britain, is actually now confined to the American 'barren-grounds;' where, also, upon the western continent, the European Bear is exclusively observed.

"Nilsson," continues Mr. Lloyd, "has a curious speculation respecting the Rein Deer. He imagines that those once inhabiting Scania came from the southward immediately after the boulder-formation,

* The main reason, I suspect, of the inferior size of the tame Rein Deer, as compared with the wild, is that the young are deprived of their necessary supply of milk. *Vide* end of note to p. 285, *antea*.

† Since the above and the note to p. 283 were written, I have seen the abstract of Dr. H. Falconer's paper 'On the Ossiferous Caves of Gower, in Glamorganshire, South Wales,' published in the *Ann. Mag. N. H.* for October, 1860, p. 297 *et seq.* The fossil Deer referred to in p. 283 *(antea)* are there referred to "species or varieties allied to the Rein Deer *(Cervus Guettardi* and *C. priscus)*." Prof. Owen's figure of what he assigns to C. TARANDUS in his *Palæontology*, p. 374 is merely a copy of a *restored* figure of a British fossil figured in his *British Fossil Mammals and Birds*, p. 479, and is therefore not authoritative.

and whilst that province was still united to Germany: that, on the contrary, those which at present inhabit the northern portion of Scandinavia, came at a much later period (and subsequent to the land stretching between the Gulf of Bothnia and the White Sea having risen from the deeps), by the way of Finnish Lapland. He has come to this conclusion from fossil remains of the Rein Deer having been found in abundance in the alluvial peat-bogs of Scania; whereas in the whole of the line of country between that province and southern Lapland, nothing of the kind has been met with." *(Ibid.* II, 191.) No diversity of race is alluded to; and there can be little doubt that the ancient British was identical with the Teutonic, and both with the existent wild Deer of Scandinavia.

The large Asiatic race, which in a tame state is commonly *ridden* by the Toungouz or Tungusians and others,* and which I suspect to be identical with the Woodland Caribou of N. America, is doubtless the so-called 'Roe-buck' of the Amûr territory noticed in p. 92 *antea*. This I gather from a passage in the Journal of the celebrated pedestrian traveller, Capt. John Dundas Cochrane, R. N. (nephew of the late venerable Earl of Dundonald), who was informed, at Boukhtarmisk, that "Rein Deer abound in the mountains [southward, beyond which is the lake from which the river Irtisch takes its rise], which also contain Sheep. The horns of the former are considered valuable, fetching two or three guineas a pair; when very young the Chinese purchase them and extract a favourite medicine; the younger the animal who has shed the horns, the greater the value." (Cochrane's 'Narrative,' 2nd edit., I, p. 180). Capt. Cochrane should have said—the younger the horns of the animal, not "the younger the animal." Old Bishop Pontoppidan, as quoted by Mr. Lloyd, remarks that—"When the Rein Deer sheds his horns, and gets new ones in

* The small Lapland race is occasionally ridden. Thus Clarke writes—"The lad who had conducted me vaulted on the back of one of them, having a Rein Deer skin for his saddle, and two scives by way of stirrups." And again, at Erontikis,—"The rest of the night was passed in mirth and rejoicing, we had races in sledges, drawn by Rein Deer, and amused *ourselves by riding* on the backs of these animals." *(Clarke's Winter in Lapland).* Capt. Cochrane, writing of the Tongousi (as he terms them) remarks—"I was amused with their manner of catching Rein Deer, as it reminded me of the hunting of wild bullocks I had seen in Mexico; with this difference only, that there the man rides a Horse fully trained, and here a Rein Deer," &c. &c. *(Pedestrian Journal,* I, 373).

their stead, they appear at first to be covered [as in all other Deer] with a sort of skin, and till they come to a finger's length, are so soft, that they may be cut with a knife, like a sausage, and are delicate-eating even raw. This we have from the huntsmen's account, who, when they are far out in the country, and are pinched for food, eat them, which satisfies both hunger and thirst." Of course they are then most highly vascular and full of blood; and thus it appears that this strange delicacy is not quite peculiar to the Chinese.

Professor Pallas, tracing the geographical range of the Rein Deer in Asia, notices the occurrence of this animal in the Kinyan Alps in Mongolia, between the rivers Amûr and Naun. (*Zoogr. Rosso-asiatica*, edit. 1830, I, 203.) It can hardly migrate annually to the sea-coast from that mountainous far-inland region, which migration is held to be a necessity of existence with the Rein Deer of Lapland. But does the large or Woodland race of this animal anywhere migrate to the sea-coast?

It is remarkable that the Rein Deer has never been domesticated in arctic America; and the more so, as the immediate *western* shore of Behring's Straits and the Aleutian Isles are inhabited by true Esquimaux (*Vide* Von Wrangell, Sabine's Translation, pp. 343, 372), who cannot but know of the domestic herds in the possession of their neighbours the Tschuktschi;* but a reason may well be, that where

* By the way, Dr. Godman remarks that the wild "Rein Deer often pass, in summer, by the chain of the Aleutian Islands, from Behring's Straits to Kamschatka, subsisting on the moss found on these islands during their passage" (*i. e.* from America to Asia). Pennant stated that "they are not found in the islands that lie between Asia and America, though numerous in Kamschatka." They do not appear to inhabit them permanently.

Cuvier has shewn, by a laborious investigation, that, during the historic period, this animal never extended in Europe further south than the Baltic and the northern parts of Poland; and, at present, as Sir C. Lyell remarks, it "can scarcely exist to the south of the 65th parallel in Scandinavia; but descends, in consequence of the greater coldness of the climate, to the 50th in Chinese Tartary, and often roves into a country of a more southern latitude than any part of England." Referring to Dekay's 'Natural History of New York,' this author states—"It is with much hesitation that I include the Rein Deer in the *Fauna* of our State; but the representations of hunters lead me to suspect, that, when the yet unexplored parts of the State have been more thoroughly examined, its existence may be disclosed. Pennant, in his time, asserted that the Rein Deer was not found further south than the most northern part of Canada. Charlvoix, however, saw one killed at Quebec. The specimen in the cabinet of the Medical College at Albany came from Nova Scotia; and Harlan asserts that it does not pass the State of Maine into the United States, implying its existence there." Professor Emmons observes—"It is only a few years

Dogs are employed for sledging, and are unaccustomed to the sight of tame Deer, they would be very apt to attack and destroy them, as has happened in instances where individual Rein Deer have been tamed in the American fur-countries by Europeans. In Lapland, however, the herds of domestic Rein Deer are always tended by several Dogs, which guard and keep them in order and serve to hunt back any stragglers. (*Vide* Lloyd's *Sc. Adv.* II, 213.)

Referring to Dr. J. E. Gray's 'Synopsis of the Species of Deer' (*Proc. Zool. Soc.* 1850, p. 225), I observe that he admits one species only of Rein Deer, but which "varies exceedingly in size." He remarks—"They have a large variety in Newfoundland, nearly as large as a heifer [a heifer of what race ?*], having very large and heavy horns. There are some horns of this variety in the British Museum. M. Middendorf informed me that the horns of the large Siberian variety were as large as, and greatly resembled, the horns from Newfoundland (Nova Scotia) in the British Museum collection." In other words, the American Woodland Caribou, and the large race of N. Asia, are, in all probability, quite identical.

since this animal appeared in the northern parts of Vermont and N. Hampshire; from which it is not unreasonable to infer, that in earlier time it may have passed still further south. Its gregarious habits and unsuspicious character would seem to ensure its speedy destruction, when placed within the reach of man." It is well known how much the climate of the Atlantic States of N. America has been ameliorated, from the seasons being rendered less excessive, by the gradual extensive clearance of the forests; as that of N. Europe since the time of Cæsar. On the Pacific Coast of N. America, Capt. Beechey remarks that Rein Deer occur in some seasons of the year in New Caledonia (now, to avoid confusion, termed British Columbia), or the country drained by Fraser's River.

* Clarke remarks, of the Cows which he saw in his journey from Tornea to the Muonio river,—"The Cows here are all of the same white colour, and very little larger than sucking calves in England; but so beautiful, and yielding milk of a quality so superior to any we had before tasted, that we longed to introduce the breed into our own country. It is almost all cream; and this cream, with the most delicious sweetness, is, at the same time, even when fresh, so coagulated, that a spoon will nearly remain upright after it has been plunged in it. Of course," it is added, "its richness must be principally attributed to the nature of the food which, during summer, these cows select for themselves in the forests; and this consists entirely of the tender twigs and young shoots of trees." *Travels to the North Cape*, p. 309.

The pretty little Norwegian cows are thus incidentally noticed: comment about the "as if" is, of course, unnecessary. "Then came the goats and sheep, and the little cows following like dogs, now and then stopping to take a bite, when the turf looked particularly sweet and tempting—little fairy cows were they, much smaller than our Alderneys, finer in the bone, and more active in the legs; they looked *as if* they had a cross of the Deer in them. They were all of one colour, a sort of dirty cream-colour approaching to dun, and almost black on the legs and muzzle." (*Forest Scenes in Norway and Sweden.* By the Rev. H. Newland, p. 156.)

Still it is rare that even the Woodland race in America attains to the weight of 350 lbs.! One, 4¼ ft. high at the shoulder, mentioned in Capt. Cartright's Journal, weighed, his quarters 270 lbs., the head 20 lbs., offal 20 lbs.—310 lbs. in all: he had an inch of fat on his ribs, and 1½ in. on his haunches. Another, "an old buck of the dwarf breed," five inches lower at the shoulder and which had forty points to his antlers* (the former having but 29), "was in excellent order, weighing in his quarters 314 lbs., with 2½ lbs. of fat on his haunches, and 1½ in. thick on his ribs." A buck of 27 stone is also mentioned, which, "had he been killed in prime of grease, would have stood at least 31 stone, or 434 lbs. A very fat old doe weighed 154 lbs., and another 155 lbs. But all of these were particularly fine animals." In Lapland, "a fat ox-Deer weighed 122 lbs., and had 10 lbs. of tallow. This is, I suppose," continues Mr. Laing, "as much as the tame animal in general will feed to. The wild race, which comes considerably further south, is a good deal larger."

The domestic Deer of Lapland, however, vary even in neighbouring parishes. "None that I saw," relates the Hon'ble A. Dillon, "were larger than our common English Fallow Deer. Those in Russian Lapland, near Kola, are said to be much taller; while the wild ones in Spitzbergen, though exceedingly fat, *are far inferior in size.*" "The Deer which I observed, as I approached Tornea," remarks Sir A. C. Brooke, "and those I afterwards met with beyond it, confirmed me in what I had been told was the fact, that the further they live north, the larger they are; and when I saw those which were brought to England by Mr. Bullock from the Roraas mountains between Christiania and Drontheim (being the southernmost limit of their range in Scandinavia), their very great inferiority in size to the Deer of Finnmark removed all doubt on the point. Large, however, as is their size, I have been assured by persons who have made successive voyages to Spitzbergen, for the purpose of taking this animal and the Walrus, that the Rein Deer found on that island *exceed very considerably in bulk* those of Finnmark; and that their tallow alone, which is a principal object in their capture, in many of them amounts to the extraordinary weight of 40 lbs. Respecting the size of the Spitz-

* Capt. Cartwright obtained a pair "with 72 terminal points." ("Journal of 16 years' residence in Labrador.)"

bergen Deer," continues this author (at variance with Mr. Dillon, and also with a statement in the Appendix to Sir John Ross's 2nd voyage), "I have been able to satisfy myself, from having had an opportunity of seeing in London a haunch, that was brought to England, having been salted, and afterwards dressed; and from the extraordinary dimensions of it, the animal must have been *considerably larger* than any of the Rein Deer of Lapland." According to Clarke,—"The breed of Rein Deer in the parish of Eroutikis [in Lapland] is larger than that of Bickasjerf, but smaller than that of Kittila; and this difference is wholly to be ascribed to the difference in the soil, as suited to the growth of Rein Deer moss; on which account the Rein Deer of the mountains are always smaller than those of the forest."

Here, indeed, we have probably the key to the difference between the barren-ground and woodland races of America, if not elsewhere;* but the difference of *habit* is remarkable. "In the fur-countries of North America," writes Sir John Richardson, "there are two well marked and *permanent* varieties of this animal [*incipient species*, according to Mr. Darwin's theory], one of them confined to the woody and more southern districts, and the other retiring to the woods only in winter, and passing the summer on the coasts of the Arctic Sea, or on the barren-grounds.† The latter weigh so little, that I have seen a Canadian voyageur throw a full grown doe on his shoulders, and carry it as an English butcher would a sheep. The bucks are larger, and weigh (exclusive of the offal) from 90 to 130 lbs. Those of the Woodland variety from 200 to 240 lbs." "A small doe of this," remarks Hearne, "is equal to a northern buck: but, though so considerably larger, their antlers, although much stronger, are not so large and branching." In Sir John Ross's 2nd Voyage, we read that a specimen, "of larger size than ordinary," was obtained in Boothia, weighing 250 lbs. From nose to base of tail it measured 5 ft. 10 in.; the tail $5\frac{1}{4}$ in.: height at the shoulder $4\frac{1}{4}$ in.; of the hind-quarters 4 ft. 5 in.; and girth behind the four legs 55 in.; those of Melville Island, Boothia, and *Spitzbergen*, it is stated, "did not average above half the weight." Probably, therefore, a straggler of the woodland

* The American barren-grounds are physically similar to the mountainous parts of Lapland, and also to the 'tundras' of Siberia.

† He subsequently remarks—"Contrary to the habits of the Barren-ground Caribou, the Woodland variety travels southward in the spring."

race. We may accordingly presume that the current statement that the further northward this animal inhabits, the larger it grows, is true only within certain limitations, depending much on the character of the country. The large woodland race, indeed, inhabits southward of the small barren-ground race: the former migrating in summer to the polar sea; the latter southward to the mountains of the interior; and this alike in Asia and America.

A NOTE ON THE ANTIQUITY OF THE HUMAN RACES.

To which I am induced by recalling to mind a passage in the Introduction to Von Wrangell's 'Narrative of an Expedition to the Polar Sea' (Sabine's Translation, p. cxvii), wherein a flint implement is mentioned as being in use in modern times (*A. D.* 1809). Indeed, elsewhere (p. 376), Von Wrangell notices, of the Tschuktschi, that—"Iron being scarce, they sometimes employ Walrus tusks instead;" and also that—"The inhabitants of the Aleutian Isles use spears pointed with slate in killing Whales" (p. 340). So did other Esquimaux further *east* (*i. e.* in America) fashion slate as well as bone weapons until they became acquainted with the use of iron, and acquired possession of metal instruments from their European visitors.—"On Fadegew Island, Sannikow found a Jahakir sledge, and a knife, such as is generally used for scraping Rein Deer skins. The blade, however, was not of iron, but of a hard sharp *flint*. In New Siberia they had found an axe made of the tusk of a Mammoth." —Now Nilsson, exploring certain exceedingly antique *tumuli* in Scania (the *southernmost* province of Sweden), found in them flint arrow-heads or spear-heads—the so-called *Celts* or *Kelts*,—together with bones of now extinct mammalia, and human bones including skulls, which skulls were distinctly of the hyperborean type of humankind, in a latitude considerably to the southward of the abode of the hyperborean Mongol at the present epoch, unless where a a much severer winter climate obtains! Considering the ultra-remote antiquity of the 'Celts' elsewhere discovered in temperate latitudes, does not Nilsson's discovery somewhat point to the glacial period of Agassiz? Albeit the human animal most assuredly never originated in the circum-polar regions, any more than on the minor continent now called America, however ancient may be the indis-

putable human remains discovered by Dr. Lund in certain Brazilian caverns, and others since disinterred in the valley of the Mississipi! The human organism pertains strictly to the *catarrhine* as opposed to the *platyrrhine* division of anthropomorphous creatures, the former proper to the major continent, the latter to the minor continent,—the former (as in mankind) having invariably but two præ-molars above and below on either side, the latter as constantly a series of three præ-molars, &c. &c.: and it need hardly be added that the naked frame (with hair on scalp affording some protection from the sun, but certainly not from cold,) most surely indicates the original and indigenous abode of mankind to have been in a hot region of the earth, even where, at the present time, the animals most nearly akin to humanity—so far as their bodily organization is concerned—inhabit. But what do we know of the geology of the regions tenanted by the Gorilla, the Chimpanzee, and the Orangs? Just a little! Of their palæontology, almost nothing. It is therefore exceedingly premature to dogmatize or to venture to affirm whether or not a nearer (fossil) link may even yet be brought to light than is the formidable Gorilla Ape, itself a re-discovery but of yesterday, when the proper regions of the earth for such a quest shall have been duly investigated. These remarks are meant to afford little more than a hint; but it is one that will be understood by those for whom it is intended.—E. B.

A NOTE ON DOMESTIC ANIMALS IN GENERAL.

In page 291 *antea*, it is remarked that the efforts of modern Zoological and other Societies have not been attended with much result hitherto, as regards the domestication of wild animals; and I believe, as there intimated, that the subjection of all the more important domestic creatures was effected by human beings in a very rude state of savagery. Since writing those remarks, I have seen the article in No. CCXXV of the 'Edinburgh Review' on the "Acclimatization of Animals," in which the results hitherto attained are brought to notice. "The acclimatization of the Eland," we are told, "may be now considered a *fait accomplè*;" but this is, at most, a preliminary to its *domestication*, which by no means necessarily follows, or may

even be possible. The Common Pheasant, for example, was probably introduced into Britain during the period of Roman domination; yet, however thoroughly naturalized to the country (for the amount of acclimatization in this instance is inconsiderable), and also however tameable, it certainly manifests no tendency to become a domestic bird, like the ordinary Common Fowl or the Turkey. It will not attach itself to a home-stead. "The practical results," we are told, "of *reproduction* and *acclimatization* have been so entirely lost sight of for ages, that the Turkey in 1524, the Musk Duck in 1650, the Gold Pheasant in 1725, and the Silver Pheasant in 1740, are the only additions to our catalogue of domesticated animals since the Christian æra." Surely the Gold and Silver Pheasants cannot be justly termed *domesticated*, although tame, and the races permanently maintained either *in strict confinement*, or turned loose into preserves.* Most assuredly they are not likely to become free denizens of the poultry-yard; like the Guinea-fowl, the domestication of which is really of comparatively modern date. Its name of *Guinea*-fowl indicates the indigenous abode of the particular species, a country unknown to the Greeks and Romans; whose *Meleagris* and *Gallina numidica (quasi nubica ?)* referred to the species of N. E. Africa and perhaps of Arabia (NUMIDA PTILORHYNCHA of Rüppell), received by them *viâ Nubiæ*.†

Next, of the two other instances cited,—the Turkey and the Musk Duck—it is remarkable that both of these were found by the Spanish discoverers already domesticated in the New World. This Schlegel

* Neither of them has begun to vary in colour as yet, as the semi-wild British Pheasant often does, to the same extent as the tame Guinea-fowl.

† According to W. G. Browne's 'Travels in Africa,' &c. (1792 to 1798), p. 264, those birds were even then brought in cages, "as a profitable commodity," to Cairo from Darfour; and doubtless therefore at the present day also, as likewise in ancient times. There is no reason to suppose that the Romans *domesticated* them, even though they may have kept many in captivity. Prince John of Portugal, the famous patron of African discovery (but more probably one of his successors), has the credit of first introducing and multiplying the modernly domesticated species from *Guinea;* and the earliest known *distinctive* description of it is that by Dr. Caius (1570), in which the purple colour of the neck is mentioned, which will not apply to the E. African N. PTILORHYNCHA.

That the E. African bird was that known to the Romans is further distinctly indicated by an expression of Columella, who notices its "*palcam et cristam*" (peak and crest); referring to the frontal crest of N. PTILORHYNCHA (whence its name), which is utterly wanting in the bald-fronted bird of Guinea.

has remarked of the CARAINA MOSCHATA;* and the *Carnivora* of Montezuma's menagerie were fed on the flesh of domestic Turkeys.

* 'Revue Critique des Oiseaux d' Europe,' p. 108. Were the Geese of *this species* which were "bred to supply feathers for ornaments" in the now ruined city of Quiché (lat. 15° N.), which, like Mexico, had its zoological and botanical gardens attached to its palace? (Stephens's *Incidents of Travel in Central America*, II, 179.) I have not access to the original authorities, and know of no traveller more thoroughly indifferent to all matters of Natural History than was Mr. Stephens, in a country, too, so teeming with objects of interest in its *Fauna* and *Flora*. In the hunts of that most exquisitely plumaged bird, the Ocellated Turkey (MELEAGRIS OCELLATA), where so void of fear that he knocked one over with a pistol (I, 397), he does not appear to have distinguished it from the common wild Turkey of the United States (M. GALLIPAVO): and at the ruins near Palenque (within the Mexican territory, in about 17° 20′), he remarks—"We expected at this place to live upon game, but were disappointed. A wild Turkey we could shoot at any time from the door of the palace; but, after trying one, we did not venture to trifle with our teeth upon another" (II, 320). Just as, in this country, an old Peafowl has the merited reputation of being tough, as has likewise an aged gander! But it does not follow that all are not excellent eating when of a proper age. (Indeed, another writer describes the flesh of the Ocellated Turkey as "most delicious-eating." *Proc. Lin. Soc.* 1859, pt. 1, p. 62). The Jaguar (FELIS ONCA) is indifferently styled by Mr. Stephens both 'Tiger' and 'Leopard;' and the Cougar or Puma (F. CONCOLOR) is of course his 'Liou.' This was to have been expected; but that the most superficial of observers should see the Ocellated Turkey and pass no remark on its extraordinary beauty is somewhat surprising. At least it is not probable that the wild MELEAGRIS MEXICANA occurs so far southward even as Palenque; and at the modern village from which the neighbouring ruins derive their current name, the author mentions having procured a domestic Turkey for provender.

It may seem strange that the M. OCELLATA, in addition to M. MEXICANA, was not domesticated by the populous race which the Spaniards found so highly civilized (in some respects) over a vast extent of country which it inhabits; but neither have the Jungle-fowls of S. India and Ceylon respectively (GALLUS SONNERATII and G. STANLEYI *v. Lafayettii)* been domesticated, while their congener of N. India and of all S. E. Asia and its archipelago, even as far as Timor, (G. FERRUGINEUS *v. bankivus,)* has been diffused in a domestic state over the world. Mr. Gosse remarks that—"The common Turkey is, so far as European knowledge is concerned, *indigenous to the greater Antilles;* having been found by the Spanish discoverers already domesticated by the Indians; and the European domestic breed is descended from the West Indian, and not from North American parentage." *(Birds of Jamaica*, p. 329.) He gives no authority for the statement, and its accuracy is more than doubtful. As the late Mr. Broderip remarked—"Mexico was discovered by Grijalva in the year 1518: and we soon after find a description of the Turkey as one of the productions of the country by Gomarra and Hernandez, the latter of whom gives its Mexican name *Huexototl*, and makes mention of the wild birds *as well as of the tame.* Oviedo, whose work was published in Toledo in 1526, describes the Turkey well, as a kind of Peacock of New Spain, *which had been carried over to the islands and the Spanish main*, and was about the houses of the Christian inhabitants." (Broderip's *Recreations in Natural History.)* This statement of Oviedo quite disposes of Mr. Gosse's assertion of its being *indigenous* to the greater Antilles.

In tracing the southern natural distribution of the genus MELEAGRIS, it should be borne in mind that the so-called "wild Turkeys" of Guiana, mentioned by various authors, are *Curassows*, often by their own shewing; while that of Paraguay is no other than the PSOPHIA CREPITANS *(Vide* 'Letters from Paraguay, Brazil, and the Plate,' by C. B. Mansfield, M. A., 1856, p. 533); and that the *Dindons sauvages*,

It is only recently that the true prototype of the common Turkey (GALLIPAVO MEXICANA of Gould) has been made known; and the wild bird is peculiar to the eastern water-shed of N. America; the wild Turkey of the Atlantic side of the Rocky Mountains being conspicuously distinct. The domestic Turkey was imported into Spain early in the 16th century; and from Spain it was introduced into England in 1524. "This fowl was first seen in France in the reign of Francis I, and in England in that of Henry VIII. By the date of the reigns of these monarchs, the first Turkeys *must have been brought from Mexico;* the conquest of which was completed A. D. 1521."* These facts are generally known; but not the fact, for which there is abundant evidence, that the *domestic* Turkey was introduced *from Europe* into the N. American colonies, where a kindred wild species abounded in the forest.† Mr. Gould has remarked that the hybrids

or 'wild Turkeys,' of various regions of the old world are different Bustards; among others the great Bustard of Australia is not unfrequently designated the 'wild Turkey,' and the Australian TALEGALLA LATHAMI is termed the 'Brush Turkey.' But it appears that the true wild Turkey of the Atlantic side of the Rocky mountains of North America (M. GALLIPAVO *verus)* was formerly naturalized in Ireland! —"the breed, the true copper-colour, with red legs." *(Vide* Thompson, 'On the former Existence of the Capercali in Ireland.' *Ann. Mag. N. H.*, X (1843), p. 33.) The *Société d' Acclimation* should turn its attention to the naturalization of this fine species, before it is quite extirpated, in various forests of Europe. (For information regarding the Ocellated Turkey, *vide Proc. Lin. Soc.* 1859, pt. 1, p. 62, and *The Ibis*, No. VIII.)

As the indigenous range of the Turkey genus is restricted to North and Central America, so is that of the various Bustards to the major continent with Australia. But the name 'Bustard' is misapplied in the West, as that of 'wild Turkey' in the East. Thus the so-called 'Bustard' of the N. American fur-countries is the Canada Goose! (Vide Franklin's 2nd Voyage, p. 80.) Hence 'Bustard Island' on Lake Athabaska! Pernetty, in his *Historical Journal* of the *Voyage to the Falkland Islands*, under the command of M. de Bougainville, states that "We found the Bustard exquisite, either boiled, roasted, or fricasseed. It appeared from the account we kept that we ate 1500 of them." The Falkland Island Goose is probably here intended. In S. Africa, the largest species of Bustard is known as the *Paouw* (or 'Peacock') to the colonists—perhaps the true pronunciation of the Latin *Pavo*, imitative of the voice of the Peafowl.

* *Encyclopædia Brittanica.*

† The reverend divine, Mr. Francis Higgeson, who wrote 'A Description of New England's Plantation' in 1630, remarks of the harbour of Plymouth, that "the parsnips, carrots, and turnips are here bigger and sweeter than is ordinary to be found in England; the Turkeys are far greater than *our English Turkeys*, and exceedingly fat and sweet and fleshy." I take this quotation from the 'Edinburgh Review,' No. CCVIII, p. 560; and it may be that wild Turkeys are intended; but the reference to *English Turkeys* should indicate that the latter were never derived from the N. American 'plantations,' at least within the knowledge of the colonists more than two centuries ago. Again, Mynheer Vander Donk, in his 'Description of the New Netherlands' (Amsterdam, 1656), describing the State of New York as it appeared at its first settlement by Europeans, states, that "the most important fowl of the country is the wild Turkey. *They resemble the tame Turkey of the Netherlands!*"

raised from the domestic Turkey crossed with the wild species of the Atlantic States are rarely prolific.

Civilized man—or at any rate European civilized man—has domesticated no animal from the New World; he has tamed and bred certain Curassows and Guans, but it is doubtful if they can ever be trusted loose and unmutilated in the poultry-yard, like the indigenously domesticated Turkey. The only truly domesticated animals of America are sundry native Dogs, the Llama and Alpaca, and the little insignificant Guinea-pig, among mammalia; and the Turkey and the Musk Duck among birds. Of Old World species, the Rabbit has been domesticated probably within the Christian æra, and also the Ferret (to a certain extent) among *Carnivora;* but neither of these are allowed their liberty (though some Rabbits, I think, might be,) any more than are the races of white and parti-coloured Mice,—all of which are so far domesticated that individuals require no taming, and may be freely handled without occasioning distrust: the development of the breeds of domestic Rabbits is, indeed, quite of modern date; unless, perhaps, in the instance of the long-haired Angora Rabbit. I believe that all of the true Geese are most readily domesticable; and the fine Canada Goose falls within the category, but although tame Canada Geese multiply freely, they have not yet so far succumbed to the usual influences of domestication as to vary in colour, like the Pea-fowl and Guinea-fowl, and even the semi-wild and protected Pheasant and the Fallow Deer. Neither, for that matter, has the semi-domestic Swan, which differs in no respect from the wild mute species, nor the Pea-fowl and Guinea-fowl more than the semi-wild Pheasant. All of the more thoroughly subdued (and highly varying) and of the more important of domestic animals would seem to have been subjected by mankind in an exceedingly low stage of civilization.

The only domestic *Insessorial* bird is the Canary-bird; and it remains to be shewn that this also is not descended from a tame stock possessed by the ancient Guanche inhabitants of the Canary islands. With the exception of the Canary-bird, all *domestic* members of the class *Aves* are either *Pavonidæ*, *Columbidæ*, or *Anatidæ*. The only domestic mammalia are the Dog and Cat (and Ferret to a certain extent) among the *Carnivora*, the Rabbit, Mouse, and Guinea-

pig among *Rodentia*, the Horse, Ass, and Pig among *Pachydermata*, and the rest are *Ruminantia* including the *Camelidæ*.

Of other *Vertebrata*, only the CYPRINUS or CARASSIUS AURATUS; and of *Invertebrata* only one or more species of Hive-bee and of Mulberry silk-moth, unless the *grana-fina* COCCUS which is doubtful,—but the fact is attested that certain insects are *domesticable*. Among mammalia, however, there is the crowning instance of all-dominant civilized and domesticated mankind. Other species are or have been (the individual, not the race,) tamed and trained, as the Elephant—the Chita, Caracal, and even the Lion,—the Otter and the Cormorant,—and various *Falconidæ*;* but not any of these can claim to be regarded as domesticated races. A few more years will perhaps show whether civilized man is competent to add to the number of the latter.

I now pass to another and comparatively unimportant matter, which I have not before discussed in a scientific Journal. Having treated of the domestic Turkey, it may further be remarked that the origin of the English name *Turkey* has been much discussed, as applied to a bird indigenous to America. The question has often been asked, and I think that it can be answered satisfactorily. It is certain that the *Guinea-fowl* was commonly termed the "Turkey Hen" in former days, and hence a difficulty sometimes in knowing which bird is meant by sundry old authors. As the Portuguese discoveries along the west coast of Africa preceded those of the Spaniards in America, there is reason to infer that our British ancestors became acquainted with the Guinea-fowl prior to their knowledge of the Turkey; and the English trade being then chiefly with the Levantine countries, our ancestors may well have fancied that it came from thence. Referring to a curious old dictionary in my possession (published in 1678), for the word *Meleagris*, I find it translated "a Guinny or Turkey Hen:" *Gallinæ Africanæ seu Numidicæ, Var. sive quæ vulgo Indicæ*" *(Coq d' Inde* of the French, corrupted into *Dinde* and *Dindon!)*. Again, *Numidica guttata* of Martial is rendered "a Ginny or Turkey Hen." Looking also into

* Add the Pig-tailed Monkey (INUUS NEMESTRINUS) in Sumatra, where trained to gather cocoa-nuts; whence termed by Raffles *Simia carpolegus*. Also CYNOCEPHALUS HAMADRYAS by the ancient Egyptians. (*Vide* figure in Wilkinson's 'Domestic Manners of the ancient Egyptians,' I, 150.)

an English and Spanish Dictionary of so late as 1740, I find *Gallipavo* rendered "a Turkey or Guinea Cock or Hen." Well, it is known that our British forefathers originally derived the domestic Turkey from Spain; and meanwhile they are likely to have obtained a knowledge of the true *habitat* of the Guinea-fowl; and therefore may very probably have supposed the former to be the real *Turkey*-fowl, as distinguished from the *Guinea*-fowl; and if the word 'fowl' be dropped in the one instance and not in the other, be it remembered that there was another special meaning for the word *Guinea*, having reference to the Gold Coast;* otherwise the bird might have come to be known as the 'Guinea,' as the Bantam-fowl is now currently designated the 'Bantam,' and the Canary-bird as the 'Canary,' or the Turkey-fowl the 'Turkey.'† The latin-sounding name *Gallipavo* seems to be of Spanish origin, and obtains among the Spaniards to this day; but their earliest name for it was *Pavon de las Indias*, "c'est a dire," as Buffon remarks, "*Paon des Indes Occidentales;*" which explains the reference to India (perpetuated in *Dindon*).

* The name *Guinea-pig*, I believe, is not a corruption of 'Guiána-pig' (as has been suggested); but the animal was brought to Europe in the Guinea slavers on their return voyage; who also brought sundry small African Finches, which have been described as natives of Brazil. It is curious that the Musk Duck was formerly known in England as the 'Guinea Duck,' also because brought from S. America by the Guinea slavers, and it was considered as a great delicacy for the table; and the white breed of it is mentioned by Dr. Caius, so early as 1570, by the name of the 'Turkish Duck!' This species was noticed by Crawfurd in the Siamese capital, and there known as the 'Manilla Duck.' It has long been diffused over S. E. Asia, and is now common even in Polynesia. (Vide Ellis's *Missionary Tour through Hawaii*, &c.)

† Another curious instance of the kind is that of the small speckled red Finches of India (ESTRELDA AMANDAVA), which have long been known in England by the name of 'Amadavats.' They are more than once familiarly referred to, as 'Amadavats,' in Sheridan's 'School for Scandal' (Act V, Sc. 1), brought out in 1777. And they actually take this name from the city of Ahmedabád in Guzerát! Witness the following passage from 'A New Account of East India and Persia,' by John Fryer, M. D., *Cantabrig.* (1698). Among other curiosities brought to Surát, were—"From *Amadavad* small birds, who, besides that they are spotted with red no bigger than measles, the principal chorister beginning, the rest in concert, make an admirable chorus." In the 'History of the Settlements of the Europeans in the East and West Indies,' translated from the French, by J. Justamont in 1776, I find the name of the Guzerát city spelt *Amadabat!* And hence, again, the specific name *Amandava* of Linnæus, and the generic name *Amadina* of Swainson! The French term these pretty little birds *Bengális*, adopted as the English generic appellation by Swainson in treating of sundry African species. Our Indian bird is the *Bengalus punctulatus* of Brisson, *le Bengali piqueté* of Buffon, and *Amaduvade Finch* of Albin (about 1750). The name *Bengali* has probably reference to Benguela in W. Africa, whence sundry of the tribe had been brought to Europe.

At the present time the domestic Turkey is nowhere raised more abundantly, nor is more cheaply procurable, than in the country from which it thus erroneously derives its English name: for, although the Musalmáns of India refuse to eat its flesh, (alleging that it partakes of the nature of the Hog, as shewn by the tuft of bristles on its breast,) their co-religionists of Turkey, Egypt, and even Arabia (at Jidda at least, the port of Mekka), esteem it highly; and at Cairo it is customary, some hours before killing one, to give it a dose of *ráki*, which is believed to render the flesh more tender. The only Turkeys I have seen in India are of the Norfolk breed, with generally black plumage; and this, with the bare skin of the head and neck, may possibly have led to a supposition that the bird is akin to a common black Vulture of the country, with bare red neck, the OTOGYPS PONTICERIANUS;* yet, if the bird had been introduced by Muhámmedans—say from Persia, instead of by Christians from Europe, it is probable that people of that faith would have eaten the Turkey here as elsewhere. Old Chardon mentions its introduction into Persia from Venice by some Armenian merchants.

* Some Turkeys which I once possessed did actually associate, to a certain extent, with a Vulture of the kind chained to a post; that is to say, they generally kept near it, as if imagining the black Vulture to be one of their own kind.

Literary Intelligence.

Dr. Haug writes from Poona, in a letter dated November 16th, that he has sent to press, in Bombay, the text of the Aitareya Bráhmaṇa,* prepared from three MSS. He is also engaged in making an English translation with notes. Dr. Haug has some thoughts of having a Mahratta translation prepared as well;—which will indeed be a novelty in India! "An edition and English translation of the most important parts of the Rig Veda and Yajur Veda will follow." —The second part of his very able work on the Gáthás of Zoroaster is also shortly expected from Germany.

The British Museum has lately secured the pick of Capt. Hay's Bactrian collections for £260, and the choice cabinets of Col. Abbott have also, by the owner's liberality, been temporarily placed in the same Institution so as to be available for all scientific purposes.

The following is an extract from a very interesting letter received by the President from Col. Cunningham. It is dated 30th September, and is, we hope, only the forerunner of further valuable communications from the same quarter. The inscriptions here referred to have arrived in safety, and are now undergoing translation by Babu Rájendralal Mitter. We publish also the list of coins sent by Col. Cunningham for sale or exchange, in order that others may have the opportunity of supplying themselves at the prices fixed with such coins as the Society do not take.

"The inscriptions which I possess are about equal in number and in importance to the whole that have yet been published in the Journal from its first commencement.

"The earliest inscription which I can bring to your notice is one of Asoka's rock edicts in Indian Pali containing the names of Antiochus, Ptolemy, Antigonus, Magas and Alexander. For the knowledge of this inscription I am indebted to Mr. Forrest of the Canal Department, who discovered the inscription on a huge boulder, or isolated rock, on the western bank of the Jumna, at Khalsi (or Khalsi kangra) *within* the Sewâlik range.—I have only seen a portion of

* M. Regnier, we believe, is preparing an edition in Europe, which will be accompanied by Sáyana's Commentary.

the inscription copied by hand by Mr. Forrest—but he will no doubt be able to make a complete copy during the approaching cold weather. —I may mention that the letter R is not used at all in this inscription, L being invariably substituted as in *Laja* for *Raja*, and in *dala* instead of *dara* in the name of Alexander.

"I propose to send you the inscriptions by an early opportunity.—One of them I enclose at once, which is the earliest that has yet been found connected with Gwalior. If Rájendralal will kindly undertake to translate the inscriptions, I shall feel myself most deeply indebted to him. His knowledge of the various ancient characters is extensive, and he will have little difficulty in transferring the inscriptions into modern Nagari. But Rájendralal has not the same experience of ancient inscriptions that I have had, and I think it would be worth while if he, or you, or the Secretary of the Asiatic Society would send me the Nagari transcript along with the translation for comparison. I ask this because I am aware of the numerous mistakes in the transcripts and translations of previous inscriptions. I will only refer to *three* inscriptions just now.

"1st.—In the inscription on the Boar Statue at Eran, James Prinsep read the Rája's name as Tárápáni—whereas it is Toramána.

"2nd.—In an inscription translated by H. H. Wilson (see Thomas's Prinsep's Antiquities, II. 245 note 2) the 4th and 7th names are given as *Vrádipta* and *Siddha*. They should be *Pradipta* and *Singha*. There are other mistakes besides these.

"3rd.—In the great inscription from Kajráha in Bundelkhund, translated by Sutherland, the mistakes are numerous and important, See Journal Asiatic Society of Bengal, 1839. For instance—the date should be Samvat 1056 instead of 1019. The inscription was not re-engraved in *kakuda*, or 'bad' letters, but in *kumuda*, or 'beautiful' letters. The author of the inscription was Dhanga, not Banga, and he did not live 109 autumns *(satam sanavakam)* but upwards of 100 autumns *(satam samadhikam)*. Of his ancestors Vágyati and Vahila should be Vákpati and Ráhila. The latter formed the lake which is now called Ráhilya Ságar to the south of Mahaba.

"The correction of the name of Banga to Dhanga is of the greatest value to the history of the Chandels as it connects the Kajráha inscription genealogy, which ends with him, with that of the Mhow

inscription genealogy which begins with him (see Price's translation of this inscription in the 12th vol. Asiatic Researches).

"The Kajraha inscription must of course be revised—but I possess an earlier and equally long inscription of Dhanga, dated in Samvat 1011 or A. D. 954, just forty-five years prior to the other which records his death. A third long inscription refers to Sri Kokalla; but the date, I think, precludes the possibility of this referring to the great founder of the Kuláchuri Haihayas.

"Of the Gwalior inscriptions one of the most interesting is a record of Bhoja Deva, dated in 933 Samvat—both in words and figures = A. D. 876. As this date agrees with that assigned to the great Bhoja of Malwa by Kalhan pundit, viz. A. D. 883—901, there can be little hesitation in attributing this inscription to the *famous* Bhoja—(N. B. The form of the figure 9 in this date is the same as that which Rájendralal has read as 7.) There are many interesting inscriptions of the Kachwáhas and Tomaras of Gwalior—which will afford a sketch of the destinies of the fortress from about A. D. 800 down to the present time. A poem which I possess by the Bard Kharg Rai connects the last Kachwáha prince of Gwalior with the founder of the Kachwáha dynasty of Amber (Jaipoor). The traditions still preserved at Narwar connect that large fortress with the same prince. Tod calls him Dula Rao—but that was not his name. He was called Teg-Pál, and lost his ancestral kingdom by his absence for two years in Rajputána, where he went to fetch his bride. The beauty of the bride and the dalliance of the 'bridegroom' *(dulha)* are celebrated by the poet; and tradition still preserves the story of the loss of his kingdom by *Dulha Rao*, or the 'Bridegroom Prince.'

"Amongst the latest illustrations of the fortunes of the Gwalior family, I may refer to the Sanskrit inscription which was placed over the Kathantiya gate of the fort of Rohtás. (See Journ. As. Soc. Bengal, Sept. 1839.) In this the family is called *Tomara*, and not *Tuar*, as by Tod. The name of the 4th prince has been misread: it should be *Dunggara*, and not Hangara. Eight of the family were Rájas of Gwalior from Vira Sinha the contemporary of Taimúr to Vikramaditya, who fell on the field of Pániput, fighting against the emperor Baber. You will find all these Rajas mentioned in Ferishta's History at different times.

"I have just packed up five of the Gwalior inscriptions, which will be taken down to Calcutta by an officer who starts to-morrow from Nynee Tál. I have duplicate copies for comparison with the Nágari transcripts that may be sent up to me. I have added also an inscription in small characters from Ratanpur, in the Nágpur district.

"Another very large inscription in middle-sized well formed letters contains a long genealogy of some unknown princes—with, apparently, the history of a temple between Samvat 960 and 1025, or for sixty-five years. The money of the time is called '*Sri-mad Adi Varáha dramma*,' which is clearly the small silver Varáha coinage bearing the Boar incarnation on one side, and the legend 'Sri-mad Adi Varáha' on the other. A new era is also mentioned, as well as I can remember now (for the inscription is with Mr. Griffith) the Varáhada era, beginning about 438 B. C., which is probably therefore the same as the Virát era. There is a Máharája Bhoja Deva in this list also.

"I enclose a small inscription from Kajráha which will show Rájendralal two things.—1st, that there may be a blunder in a date, notwithstanding the care that *ought* to have been taken—and 2nd, the form of the figure 5, which is like our English 5 with rather a long head. This peculiar form of the figure is found in one inscription along with the common 5. I should be glad to have a translation of this inscription if Rájendralal would kindly undertake it. The date is probably 1011—at least I satisfied myself by personal inspection that the figure 1 was first engraved and afterwards changed to ○. I understand the inscription to record a series of gifts to the temple of Jinanáth by Dhánga Rája. The gifts are numbered.—1st, the Páhila Garden. 2nd, the Chandra Garden. 3rd, the Little Chandra Garden. 4th, the Sankara Garden. 5th, the Panch Itala Garden. 6th, the Mango Garden. 7th, the *Dhánga* Tank. Perhaps Dhánga should be read Ghánga; but in the 3rd line he is called Rája; and I feel inclined to identify him with the Dhánga Rája of the large inscriptions from the Bráhmanical temples.

"Of coins I can tell you but little, not from want of new matter, but from want of time. Of novelties I may, however, mention a square copper coin of a new king, Epander, and a tetradrachm of Antiochus *Nikator* with the name of Agathokles on the reverse.

The title of Nikator is, I believe, unknown as belonging to an Antiochus. I have also a hemidrachma of Nikias; and Mr. Bayley and I have each a hemidrachma of Diomedes, but of different types.

"Of Hindu coins I may mention that Mr. Bayley has a gold specimen of *Pravarasena* of Kashmir, and that I have several specimens in copper of *Mihira kula*, and one specimen of *Hiranya kula* and one of Gokarna. These coins prove that Professor Lassen's arrangement of the Kashmir dynasties is untenable. I have also a fine specimen of Tribhuvana Gupta's coinage.

"Of Indo-Scythian coins the finest specimens are in gold. One has a male figure standing beside a horse with the legend APΘOACHO, 'the divine steed.' The figure is like that of MIIPO, *Mihir*, or the sun, to whom the horse was sacred. Another coin has a figure standing full face with the legend MAACHNO, that is *Mahásena*. Another coin has two figures both standing to the front with the legend CKANΔO KOMAPO BIZAΓO—that is *Skanda-kumára, Visákha*. Now Mahásena, Skanda, Kumára, and Visákha are all titles of Kárttikeya, the god of war—and I believe that these coins give us the earliest notices of this god.

"By a late paragraph in one of the Calcutta newspapers, I see that the Asiatic Society are anxious to part with some of the duplicate coins of the Stacy collection. I propose therefore to exchange some of my duplicates with the Society. For this purpose I have sent off a packet of coins to your address—all labelled and priced, as per accompanying list—from which the Society can select such coins as they may wish to possess to the extent of 800 Rs. in exchange for a number of the Society's coins, which I have selected from the Stacy collection as per accompanying list. I think that you will find a very great variety amongst the coins which I send down—and some most beautiful and rare specimens. Amongst them are specimens of the Indo-Scythians APΘOACHO and CKANΔO KOMAPO.

List of Coins for Sale or Exchange.

Metal. G.	S.	C.	Persia.	Rs.	As.	P.
1	0	0	Daric, ...	30	0	0
0	3	0	Darics, ...	15	0	0

			GREECE.				
0	1	0	Alexander the Great, tetradrachm,	25	0	0	
0	1	0	Lysimachus, drachma,	10	0	0	
			SYRIA.				
0	1	0	Antiochus Theus, tetradrachm,	30	0	0	
0	2	0	Ditto ditto drachmas,	12	0	0	
0	0	1	Demetrius Head of Diana and Tripod,	10	0	0	
0	0	1	Ditto horse's head and elephant's head,	5	0	0	
			BACTRIA.				
1	0	0	Diodotus, stater,	100	0	0	
0	1	0	Eucratides, tetradrachma,	20	0	0	bare head.
0	1	0	Ditto ditto,	25	0	0	helmeted [head.
0	0	1	Lycias,	5	0	0	
0	1	0	Apollodotus, hemidrachma, head,	10	0	0	
0	3	0	Hippostratus, didrachmas, 3 types,	60	0	0	
0	1	0	Hermæus, didrachma,	15	0	0	
0	1	0	Ditto drachma,	10	0	0	
0	1	0	Azas, didrachma, Jupiter,	16	0	0	
0	4	0	Ditto hemidrachmas, 4 types,	8	0	0	
0	2	0	Azilisas, didrachmas, 2 types,	30	0	0	
0	2	0	Ditto hemidrachmas, 2 types,	5	0	0	
0	1	0	Vonones and Spalhores,	10	0	0	
0	1	0	Vonones and Spalgadames,	10	0	0	
			ROME.				
0	0	2	Roman copper As and Semis,	5	0	0	
0	7	0	Demarii, picked coins at 6,	42	0	0	
0	2	0	Cistopori, Antony and Cleopatra,	100	0	0	
1	0	0	Theodosius,	20	0	0	
3	36	5		628	0	0	

GREECE.

0	2	0	Aegina, different sizes,.....	20	0	0	Tortoise.
0	1	0	Lesbos, ...	6	0	0	2calves'heads.
0	1	0	Tarentum,.....	5	0	0	Man on Dolphin.
0	1	0	Argos, ...	2	0	0	Wolf's head.
1	0	0	Asia Minor: A Heeta, ...	15	0	0	Electrum.
0	1	0	Corinth,.....	2	0	0	Pegasus.
0	1	0	Miletus,.....	2	0	0	Lion's head.
0	1	0	Colchis, ...	2	0	0	Female head.
0	1	0	Phocis, ...	2	0	0	Ox's head.

INDO-SCYTHIAN.

1	0	0	Kanerki, *Rev.* ΦΑΡΡΟ, ...	50	0	0	large.
1	0	0	Ditto, *Rev.* ΜΑΟ, ...	50	0	0	ditto.
1	0	0	Ditto, *Rev.* ΑΘΡΟ, ...	50	0	0	ditto.
1	0	0	Ditto, *Rev.* ΑΡΘΟΑCΠΟ,...	80	0	0	ditto.
1	0	0	Ditto, *Rev.* ΟΡΑΑΓΝΟ, ...	60	0	0	ditto.
1	0	0	ΟΚΡΟ, ...	50	0	0	ditto.
1	0	0	Oerki, Rev. ΜΙΙΡΟ, ...	50	0	0	ditto.
1	0	0	Ditto, Rev. CΚΑΝΔΟ-ΚΟΜΑ-ΡΟ ΒΙΣΑΓΟ,.....	60	0	0	ditto.
1	0	0	Ditto, Rev. ΦΑΡΡΟ, ...	16	0	0	small.
1	0	0	Ditto, Rev. ΑΡΔΟΧΡΟ, ...	16	0	0	ditto.
1	0	0	Ditto, Rev. ΑΙΝΟ, ...	16	0	0	ditto.
15	45	5	Co.'s Rs.	1,182	0	0	

Amethyst. Peleus and Thetis, by *Pyrgoteles*, the gem engraver of Alexander,.....	300	0	0
Head of Socrates, pink stone,	20	0	0
	1,502	0	0

The 7 *Roman Denarii* are—

Licinia,..... Head of Vejovis C. LICINIVS L. F. MACER.
——— Ditto ——— Rev. Jupiter on a goat.
Seribonia, ... Female head. Rev. PVTEAL.

Acilia, ... Head of Venus, Juno Sospita with snake.
Plancia, ... Youthful head. Rev. Goat.
Metella,..... — P. METELLVS, SCIPIO, IMP.
Augustus, ... Bare head, CAESAR, COS. V. Rev. Crocodile AEGYPTO CAPTA.

In a subsequent letter Col. C. adds that he has a square copper coin of Demetrius with an Arian legend. 'In the Greek legend he takes the title of Nikator, which is translated by Aparajita, and not by the Aparahata of the later kings.'

In another letter dated 16th December, Col. C. writes of still further additions of rare and unique coins made to his cabinet.

"The unique coins are 1st, a gold dinar of Kanishka with *Greek* legends—obverse BACIΔEYC BACIAEωN KANHPKOY—and reverse HAIOC. 2nd, a similar gold dinar, with the same figure on the reverse but with both legends in the native language, but Greek characters, respectively PAO NANO PAO KANHPKI KOPANO and MIIPO—one of the rarer coins which I have obtained is the dinar of *Hoërke* with three figures on the reverse. The specimen is in the most perfect preservation—and the reverse legend is distinct, exactly as I formerly read it—CKANΔO KOMAPO MAACHNO BIZAΓO, these being three of the well known names of the Indian god of war—

Skanda-kumára, Mahásena, Visákha.

"But a still more interesting and valuable discovery of this prince Hoërke is the mention of a Vihár named after him in one of the newly found Mathura inscriptions. The inscription records a gift to the monastery of the great king of kings, the heaven descended *Huveshka.* Now as the name of Kanishka became Kanerke on the coins, I infer that *Huveshka* would have been rendered *Huverke* or in Greek OOHPKE, which has hitherto been looked upon as equivalent to Hoërke. The only record of this prince's name is in the Rája Tarangini where he is called *Hushka,* which may either have been the usual contraction of his name—or the casual contraction to suit the metre of Kalhan pundit's verse.

"This discovery has further led to the true reading of the prince's name in the Ariano Pali legend of the Wardak Vase. In Prinsep's Indian Antiquities, Vol. I. p. 63, Thomas reads the name as *Hovesh-*

shandra, and I was myself inclined to adopt Harischandra, but I feel satisfied now that the true reading is *Hoveshkasa*.

"Three of the Mathura inscriptions are dated in figures the same as those on the Sah coins of Saurashtra, but with the addition of the puzzling ×, a real unknown quantity, which is also found in the Ariano Pali inscriptions of Manikyala and Wardak. One correction of a previous error I have already derived from these inscriptions—namely that the character *di*, which I read as 10 in the Sanchi inscription, is really only a contraction for *divasa* = day. The date of the Sanchi inscription is therefore *san* 93 *Bhádrapada di* 4.—"In the year 931 Bhádrpad, 4th day."

"Amongst the Muttra inscriptions there is one recording the gift of a statue of *Sákya Bhikshu*, on the pedestal of a small standing figure. Amongst the names of donors are *Buddhánanda*, Buddhaghosha, and Buddarakshita. Amongst the sculptures are the well known representation of Máyá, the mother of Buddha, holding by the branch of the Sál tree previous to her confinement. There are also the birth of Buddha (the infant with a halo round his head); the meditation; the teaching; and the death. There are several colossal figures of Buddha, and numerous pillars belonging to that peculiar kind of stone enclosure which I have named the "Buddhist railing." No less than twenty-six bases of pillars have already been found; and more will no doubt be found hereafter. Altogether I consider that the mounds of Mathura most probably contain remains of greater antiquity than those of Benares, and I look forward to further discoveries with much interest."

Dr. Sprenger writes from Berne that he has already printed some 200 pages of his continuation of the Life of Mahommed.

In the following extract from a letter from Mr. E. C. Bayley, dated 10th November, will be found an interesting passage regarding plated coins, an instance of which occurred among some old Egyptian coins lately presented to the Society by Mr. C. J. Evans. Mr. B. also pursues the subject of the identification of 'Sahet Mahet' described in his previous letter on the information communicated to him by Rájah Maun Singh.

"First as to plated coins, they are not uncommon, and are evidently ancient, I have myself met with didrachma of Hippostratus, Azilizas, and Azas, with a drachma of Hermæus and with hemidrachmas of Menander, Apollodotus and Philoxenes, &c. I have no doubt too the celebrated silvered Kadphises was one of this type. I have even found a copper hemidrachma of Menander which had clearly never been silvered. Once too near Rawul Pindee I found in a village an immense hoard of Satnanta Deo coins evidently intended to be silvered. They were in brass and blundered terribly in their execution. I have no doubt that the ancient Hindu passed bad money as often as his modern descendant.

"This much for that question. In "re Sahetanâ" I have succeeded by the aid of Fa hian, in getting a clear identification of Sahet Mahet. I find this in the account of Buddha's death ('Sakya Muni') which Laidlay, in speaking of Kusinagar, extracts from Turnour's Mahawanso. In it Sakya Muni's disciples are represented as remonstrating with him for selecting so insignificant a place as Kusinagar as the scene of his 'nirvana,' and ask why he has not selected one of the six neighbouring great cities, 'Varanasi' (Benares), 'Rajagaho' (Rajgriha), 'Sawattho' (Sravarti), SAHETAN—Kosambhi or Champa. Sahetan is clearly 'Sahet Mahet.' I have since heard from C. A. Elliott and from the Rája of Kupoorthulla, who have both visited it, and who confirm Maun Singh's description in all respects. It is, the former says, Jilnabed *on* the Raptee. It is in the Kupoorthulla Rájah's illaka, and he purposes clearing it of jungle. This cold season I have spoken to him about it, but it would do no harm if you write to him. He is a very intelligent man and speaks admirable English very fluently. It is no doubt a good field, and I would advise your trying it.

As to '*Champa*' and '*Kosambhi*' mentioned above, the former is, I suppose, perhaps to be looked for about Champarun, if similarity of names is worth anything. Kosambhi, Fa hian places N. W. of Sarnath at Benares and at a distance (13 yieow yau = 60 miles) which would land it near Sultanpur, near to which as I told you Rája Maun Singh says, there are Buddhist remains.

"But the pundits here declare it is identical with Karra Manikpur. I had, however, a discussion on the subject and found that their

authority was the Vrihat Kathá or Kathá Sarit Sagar, and that this they declared maintained that Kosambhi was on the Ganges. However, they brought me a portion of this work to-day, and admitted that on referring to it they found that it merely said that the Ganges flowed through the *realm* of Kosambhi, but that one passage almost distinctly said that Kosambhi was not on the Ganges, for it said that the king built it away from rivers to avoid being washed away by them. This book, however, declared that it was founded by 'Satá-kánik,' translated as 'him of the hundred battalions' and son to 'Sahasrakanik, king of the 1000 battalions.' Can Kosambhi be the 'Sanakaniha' of the Allahabad and Sanchi inscriptions?"

We are at last in possession of a cast in clay of the famous inscription on the Behar pillar of which an incorrect reading was published in our Journal many years back. The cast is in the hands of Babu Rájendralal Mittra, who hopes to succeed in deciphering and translating it.

Several facsimiles of this inscription have been at different times procured, but the impressions given by them have been too faint and indistinct to allow of the text being correctly read. We owe the present cast entirely to the exertions of Mr. Charles Hollings of Gyah, who deserves the Society's cordial thanks for the perseverance with which he has endeavoured to meet their wishes in regard to this pillar and the important record which it is believed to bear.

Capt. Lees is engaged in printing for the use of his College the *Kholdi Barín* (خلد برين) of Wahshi (وحشي) who died A. H. 992. He was born in Kirman, but as he resided chiefly at Yazd, he is generally called *Yazdi*. The *Kholdi Barín* is a short *Masnawi*, written in charming Persian and in the same metre as Jámi's Sabhat ol-Abrar, and is deservedly popular. The author is sometimes, in India, confounded with Wahshi-i Dawlatabádi, but though poems are ascribed to him, nothing certain appears to be known about him. Wahshi-i Dawlatabádi must apparently be Wahshi-i Káshi, a pupil of Mohtasham i Káshi, who came to India, and lived here for a long time. He died in India A. H. 1013.

ERRATA IN VOLUME XXVIII.

Page 124 line 6 ab infra, *for* आद्याशक्तिं *read* आद्यां शक्तिं.
„ 125 „ 19 *for* जानाति वेदं *read* जानानि वेद.
„ 129 „ 15 *for* स *read* म.
„ 129 „ 5 ab infra, *for* निन्द्यं *read* विन्द्यं.

ERRATA IN THE PRESENT VOLUME.

Page 324 line 5 *for* dated *read* stated.
„ — „ 20 *for* אָחַז *read* אָחָז.
„ — „ 29 *for* گستن *read* گسستن.
„ 338 „ 24 *for* دادا *read* دادر.
„ 343 „ 2 *for* p. 3 *read* p. 324.
„ 344 „ 30 *for* شکشتن *read* شکستن.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

FOR SEPTEMBER, 1860.

The Monthly General Meeting of the Asiatic Society was held on the 5th instant—

Major H. L. Thuillier, Vice President, in the chair.

The Proceedings of the last Meeting were read and confirmed.

Presentations were received—

1. From Dr. C. Holst, Secretary to the Royal University of Christiania, the latest publications of the University.

2. From the British Association for the Advancement of Science, a report of the 29th Meeting of the Association held at Aberdeen, in September, 1859.

3. From the Secretary to the Government of Bengal, the latest Report of the Geological Survey of India.

4. From the Acting Principal of the Grant Medical College, Bombay, a copy of the report for the College Session 1859-60.

5. From Baboo Rungalal Banerjea, a copy of his work on the Importance of Physical Education, being the first work of the kind in the Bengali language.

6. From Mr. J. C. Evans, a few coins found by himself in Egypt; among these are some genuine Ptolemies and one or two forgeries of the Ptolemaic period.

7. From Baboo Rajendra Mullick, a pair of very fine adult Cassowaries, male and female, that have been prepared as skeletons.

8. From Captain Haughton, Port Blair, Andamans, through the President, a marine annelide, taken off the coast of Sumatra.

9. From G. J. Evans, Esq., a small lizard and two snakes from Egypt.

10. From Mr. W. Theobald a few fossils from the mioeene beds of Bordeaux.

11. From Mr. J. H. Reily, Commissioner of Soonderbunds, a slab-stone containing an Arabic inscription found in a Musjid, 8 miles from Mirzagunge. A sketch of the Musjid drawn by Mr. Gomes accompanied the following letter, addressed to the President by Mr. Reily.

"I send with pleasure the deer and the stone. The latter was found on the north bank of the Slab River at an *ábád* called Byang in a *Mut* or Musjid, which is in tolerable preservation. The land round the *Mut* is now clear, but the temple was found in the jungle when it was cut down with the stone in it. There is no story or tradition attached to the *Mut*—the generation that built it seems to have passed away, and the place to have run into jungle and remained covered with forest jungle for a great number of years. The prineipal room in the *Mut* has an arched roof in good preservation inside a regular dome. The mortar of the building is not *soorkie* or pounded bricks but sand and lime, and very adhesive.

There is a good tank near the *Mut;* the inscription on the stone appears to me a verse from the Koran."

Again on the 10th July last he wrote:—

"I send a sketch of the Musjid drawn by Mr. Gomes, who fortunately had a drawing of it in his Field Book. The accompanying extract from Lieutenant Hodge's Map will shew that the site of the Musjid is about eight miles from Mirzagunge, the nearest decennially settled village. The lands about the Musjid are at present under cultivation, but there are still a few of the old forest trees standing, and Mr. Shawe's Resumption Decree, dated 1842, states that the lands were at that time under dense Soonderbun jungle. The jungle about these parts is tree, not *Nall* jungle. There are two slabs of sand-stone evidently used as steps, but bearing no inscription. The interior of the Musjid is ornamented with figures cut in brick, and the dome is very substantially built, and is about 30 feet high. There is a tank not far from the building, and I was told it was found when the jungle was eleared. Of course there are a number of stories connected with this Musjid, one is that a holy Fakeer lived in it, and tigers used to sweep the floor of the building clean with their tails every evening.

Captain W. N. Lees then read the following account of the inscription.

"I have carefully examined the inscription on this stone. The greater portion is sufficiently clearly written to be legible; but in consequence of the engraver not having calculated on the length of his inscription, the latter portion has been so crowded that, with the aid of two of the Mawlavis of the Mohammadan College, I have not been able to read it. It is as follows:—

قال النبي صلى الله عليه و سلم من بني مسجدا بني الله له
في الجنة سبعين قصرا * بني هذا المسجد في عهد السلطان
الاعظم ركن الدنيا و الدين ابي المظفر باربک شاه بن محمود شاه
السلطان بناه خان معظم اجيال خان بن - - - لدين - - - ثمانماية وسبعين *

Trans. The Prophet of God (on whom be peace, &c.,) said—"Whoso buildeth a *Masjid*, God shall build for him in Paradise seventy palaees." This *Masjid* was built in the reign of the *Soltan* the Mighty, the Pillar of the Church and State, Aboo al-Mozaffar Barbak Shah, son of the *Soltan* Mahmood Shah,—by Khan Moazzam Ojyal (?) Khan son of * * * * * * *Anno Hajri*, 870.

I do not think the builder, or his Engraver, has given the Hadith quoted correctly. I find none precisely similar in *Moslim* or *Bokhari*. Both, however, give the following from *Othman* the *Khalifah*.

قال رسول الله صلى الله عليه وسلم من بني مسجدا يبتغى به
وجه الله تعالى بني الله تعالى له بيتا في الجنة * وفي اخرى بني
الله تعالى له مثله في الجنة *

"Whoso buildeth a *Masjid*, to please, or for the sake of God, God shall build for him a house in Paradise"—or as others give it "a house like unto it." *Tirmidzi* again adds after the word *Masjid* the words "great or small" صغيرا كان اوكبيرا and in this same *Hadith* given, *apud* Nasai, on the authority of 'Amr and Anbasah for the words "for the sake of God" I find "in which God shall be praised ليذكر الله تعالى فيه. The Prophet, it would appear, then, promised the builder of a Mosque *one* house, not *seventy* houses in Paradise.

According to Farishtah, Barbak Shah ascended the throne A. H. 862, and died A. H. 879. His father was commonly called Náçir Shah, perhaps to distinguish him from his predecessor the slave and

usurper of the same name, but his full name from the inscription on this stone, it will be seen, was Náçir-al-Deen Mahmood Shah, or—Barbak was not his son at all. It is to be noticed that Farishtah, who is the only authority I have on the kings of Bengal, in entering on the subject says "It should not remain concealed that the Histories in use, are for the most part, silent regarding the affairs of the Kings of the Eastern and Western [Provinces]. I have therefore made use only of the Tarikh-i Alfi, complied by my teacher Mawlana Ahmad-i Tanáwi; and for this reason, I hope that should my readers find any discrepancies in my account of these matters they will not blame me."

The following gentlemen, duly proposed at the last Meeting, were balloted for and elected ordinary Members.

W. Forbes Goss, Esq., M. D., and

Major T. James, Bengal Army.

The following gentlemen were named for ballot at the next Meeting.

J. E. L. Brandreth, Esq., Commissioner of Delhi, proposed by Colonel J. Abbott, and seconded by Mr. Atkinson.

Moonshee Ameer Ally Khan, Bahadur, proposed by Mr. Atkinson, and seconded by Baboo Rajendralal Mittra.

Messrs. E. B. Harris, Civil Surgeon, and John Christian, (for re-election) proposed by Dr. T. Duka, and seconded by the President.

C. G. Wray, Esq., C. E., proposed by Major Thuillier and seconded by Major Sherwill.

The Council reported that in consideration of the long and important services of the Zoological curator and the greatly enhanced expense of living in Calcutta, they had resolved, subject to the confirmation of the Society, to give Mr. Blyth an additional house allowance of 40 Rs. per mensem, and to pay his whole allowances free of Income Tax.

Confirmed.

The following report of the Philological Committee was also submitted by the Council for the approval of the Society.

The Council beg to recommend the publication in the *Bibliotheca Indica*, of the *Vaiseshika Sutras*, with the valuable Commentary by Sankara Misra. Pundit Joy Narayan Tarkapanchanana, the pro-

fessor of Philosophy in the Calcutta Sanskrit College, has offered to edit the work, with a short additional Commentary of his own, which is not to exceed one fasciculus. The whole work will fill about four fasciculi. A similar offer having been previously received from another Pundit in the same Institution, Pundit Nandakumar Tarkaratna, the Committee recommended that the two Pundits should unite in editing the work. This they have agreed to do, and it will therefore appear under their joint editorship.

The report was adopted.

Mr. Cowell announced the publication in the *Bibliotheca Indica* of the first fasciculus of Zíá Barní's Táríkhi Ferozsháhi. A short account of the work was also given, as it appeared that the details communicated at a former Meeting of the Society were incorrect.

Zíá Barní compiled his history in A. H. 758 (A. D. 1357,) in continuation of the *Tabakáti Násirí* of Minhájuddin Juzjáni. It gives an account of the eight reigns during the 95 years between Bulbun's accession in A. H. 664, and the sixth year of Feroz Sháh (A. H. 758), viz. 1. Bulbun, 2. Kaikobád, 3. Jaláluddin Khilji, 4. Aláuddin Khilji, 5. Kutbuddin Khilji, 6. Ghaiásuddin Toghlak, 7. Muhammad Toghlak, 8. Feroz Sháh, to whom the work is dedicated, whence its name. For the later reigns, the author speaks as a contemporary witness, and as such he is often quoted by Ferishta in his history of the Toghlak dynasty. The work is edited from the only three manuscripts known to be extant, by Sayyid Ahmud Khan, under the supervision of Captain Lees.

The publication of this work forms an era in Oriental literature. Hitherto for the Pre-Moghul Muhammadan history of India, we have been dependent on Ferishta who flourished under the Emperor Akbar; Elphinstone's history, for instance, is entirely based on that authority. Zia Barni is the first contemporary author who has been printed to illustrate the five centuries between Mahmud of Ghazni and Baber. It is hoped that the Tarikhi Ferozsháhi will be followed by the Tabakáti Násiri,—as the two together will throw a flood of light on a confessedly obscure period of Indian history.

Communications received—

1. From Major General R. I. H. Birch, K. C. B. Secretary to the Government of India, Military Department, a copy of a report

drawn up by Officiating Inspector General of Hospitals J. McClelland, on the climate and soils of the three Presidencies as affecting the sanitary condition of European troops in India.

2. From Lord H. Ulick Browne, Secretary to the Government of India, Foreign Department, a copy of the Meteorological observations made by Assistant Surgeon Welsh at Muscat during the month of June last.

3. From Baboo Radhanath Sickdar an abstract of meteorological observations taken at the Surveyor General's office for the month of January last.

4. From Mr. H. Cope, Umritsur, the following accounts of the Aerolite which fell at Dhurmsala on Saturday the 14th July last, accompanied by a specimen.

Umritsur, 28th July, 1860.

The Secretary to the Asiatic Society, Calcutta.

Sir,—About two P. M. on Saturday the 14th of July, a tremendous mid-air explosion was heard at Dhurmsala, Kangra, Dalhousie, Madhoopoor and Goordaspoor. The vapour or smoke following the explosion was distinctly *seen* at Dalhousie about 30 miles, and at Kangra 10 miles from Dhurmsala, where the explosion, said to have resembled the discharge of an 84 pounder, was followed by the descent in various parts of the station, some two miles apart, of large masses of aerolite. One piece that fell near the Dhurmsala Police Battalion Lines, was ascertained to have been when entire, one foot in diameter, but it was broken into several fragments. Mr. R. Saunders, C. S., Deputy Commissioner of Kangra, has forwarded to me a portion, with a desire that I should do my best to have it analyzed. It strikes me I cannot do better than forward it to the Asiatic Society. A small part can be taken off for analysis, and the remainder be preserved in your Museum.

I remain, &c.,

Henry Cope.

Umritsur, 10th September, 1860.

My dear Sir,

I have the pleasure to send you an extract from a letter received from Kangra, which is about 11 miles from Dhurmsala and about 1000 feet lower than the spot on which the main mass of the aerolite fell.

"I did not see the explosion in connexion with the falling of the aerolite. I was at the time, reading with my Moonshi in my study and heard an extraordinary noise like that of thunder at a short distance. There could be no doubt that it was near, and I immediately supposed it was something else than thunder. The steady rattling noise which appeared to be travelling in a horizontal direction gradually increased to one tremendous majestic clap; after which the former steady rattling noise continued perhaps for a minute, till at last it died off very gradually. The noise appeared to be so low that I thought a volcano or something like it would immediately appear somewhere in our valley. A servant of mine happened just to return from the Post Office, and told me that above the hill on which our house is situate he had seen a fire travelling towards Dhurmsala, till at last it disappeared. [This would give it a direction from South to North. H. C.] The sky was cloudy, yet there were no such clouds as would justify the opinion that lightning and thunder had issued from them."

I hope to collect further information, which I will duly communicate.

Yours sincerely,

HENRY COPE.

5. From Mr. R. F. Saunders, B. C. S. Officiating Deputy Commissioner, Dhurmsala, Punjab, in reply to a letter of inquiry addressed to him by the Secretary, the following note accompanying an account of the same meteorite.

Dhurmsala, August 21, 1860.

MY DEAR SIR,—From the newspapers you will have seen that an aerolite fell at this station on the 14th ultimo.

I possessed myself of as many fragments as I possibly could for scientific purposes.

One of these I now have the honor to send, together with an account of its fall, in the hope that the subject may not be without interest.

Any questions you may send me regarding this phenomenon I shall be delighted to answer.

If you can furnish me with a brief account of its analysis I shall be much obliged.

Permit me to subscribe myself,

Very truly yours,
REGINALD F. SAUNDERS.

His account of the meteorite was as follows.

Extract from letter No. 927 from R. F. Saunders, Esq., Deputy Commissioner, Kangra, to R. H. Davies, Esq., Secretary to Punjab Government, dated Dhurmsala, 28th July, 1860.

In the afternoon between the hours of 2 and 2-30 P. M., the Station of Dhurmsala was startled by a terrific bursting noise, which was supposed at first to proceed from a succession of loud blastings or from the explosion of a mine in the upper part of the Station, others, imagining it to be an earthquake or very large landslip, rushed from their houses in the firm belief that they must fall upon them.

It soon became apparent that this was not the case. The first report, which was far louder in its discharge than any volley of artillery, was quickly followed by another and another to the number of 14 or 16; most of the latter reports grew gradually less and less loud. These were probably but the reverberations of the former, not among the hills but amongst the clouds, just as is the case with thunder. It was difficult to say which were the reports, and which the echoes. There could certainly not have been fewer than 4 or 5 actual reports. During the time that the sound lasted, the ground trembled and shook convulsively.

From the different accounts of three eye-witnesses, there appears to have been observed a flame of fire, described as about two feet in depth, and 9 feet in length, darting in an oblique direction above the station, after the first explosion had taken place. The Meteoric flash was said to be from North N. West to South S. East. Fragments of the aerolite fell in the same direction at the following places.

In the Ravine below the Dhurmsala Kotwallee at the village Sadeir.

On the Barrack Hill close to the Convalescent Depôt.

At River Guj 4 miles from the Kotwallee.

On the parade ground of the Sheredil Police Battalion, between the graveyard and the Native Distillery.*

In the village of Keyraree on the Hill to the right of the station looking towards the plains and at the Bowarna Thanah.

Specimens from each of the above localities have been brought into the station.

It is said that the Meteoric stones fell likewise at the following places, but no specimens have been received from them. At Kangra near the slate quarries, at Madhopore and at Bissowlee on the Ravee, and in parts of Chumlea and Rhilloo.

I am making further enquiries with regard to these places.

The stones as they fell, buried themselves from a foot to a foot and a half in the ground, sending up a cloud of dust in all directions.

Most providentially no loss of life or property has occurred.

Some coolies, passing by where one fell, ran to the spot to pick up the pieces; before they had held them in their hands, half a minute, they had to drop them owing to the intensity of the cold which benumbed their fingers.

This, considering the fact that they were, apparently, but a moment before in a state of ignition, is very remarkable, each stone that fell bore unmistakeable marks of partial fusion.

The morning and afternoon, preceding the occurrence, had been particularly dull and cloudy. Temperature was close, sultry, and oppressive. The thermometer was above 80 degrees of Fahrenheit, and no rain had fallen. I had no barometer by me at the time, I am therefore unable to state what was the precise pressure of the atmosphere. The clouds, which were of the form technically called cumulus and cirrhus, were hanging low at the time and the atmosphere heavily charged with electricity.

Such are simply the facts of the case as they occurred.

There are of course all sorts of conjectures as to the probable cause of the occurrence, some state the stones to be of volcanic origin, others that they were hurled from the heights above the station or projected from the moon, but I am inclined to regard them as real bonâ fide meteorolites. Their weight seems to indicate that they are semi-

* It must be noticed that Keyraree, the Barrack Hill, the Kotwallee, the Kudd, the Graveyard and Bowarna are in one direct line, from N. N. W. to S. S. E.

metallic substances composed probably of meteoric iron alloyed with nickel and mixed with silica and magnesia or some other earthy* substance. They are nearly double the weight of a piece of ordinary stone of similar dimensions.

I have sent specimens of the aerolite to the Museums at Lahore and Umritsur, and to a Scientific Institution in America.† I am about also to send others to the Academy of Sciences in France, to the Asiatic Society in Calcutta, and to Mons. H. Schlagintweit at Berlin in Prussia, for examination and report.

One fact, if true, is curious, viz., that the report preceded the flash instead of following it; this I cannot at all account for.

Another very singular phenomenon was witnessed at Dhurmsala on the evening of the same day, that the aerolite fell; this appears to have been a succession of igneous meteors such as fire balls, or falling or shooting stars. This singular sight did not attract the attention of most people. I quote the account from the writer who describes it, *verbatim*.

"I think it was on the evening of the same day that the meteor fell that I observed lights in the air. They commenced to appear about 7 P. M., and lasted for about three hours till 10; they appeared for about one minute, some for longer, then went out again, other lights appearing in their places; sometimes three or four lights appeared in the same place, together, and one or two moved off, the others remaining stationary, they looked like fire-balloons, but appeared in places where it was impossible for there to have been any houses or any roads, where people could have been. Some were high up in the air moving like fire-balloons, but the greater part of them were in the distance, in the direction of the lower hills, in front of my house, others closer to our house, and between Sir A. Lawrence's and the Barracks. I am sure from some which I observed closely that they were neither fire-balloons, lanterns, nor bonfires or any other thing of that sort, but bonâ fide lights in the heavens. Though I made enquiries amongst the natives the next day, I have never been able to find out what they were or the cause of their appearance."

* Probably chrome and cobalt too I think, R. S.

† The Smithsonian; also to the Museums of Munich and Vienna; to Turin, Sardinia, The British Museum, London, and to one or two other localities.

Verily this has been an extraordinary season in more ways than one.

In different newspapers I have read accounts of other very extraordinary phenomena, all occurring within the last few months, for instance, an aerial meteor or water spout in the neighbourhood of Bhurtpore where an aerolite is said also to have fallen, a luminous meteor or something which, from the newspaper account, reads like an Aurora Borealis at Delhi, this was on the night before the meteorolite, a shower of live fish at Benares, unaccompanied by rain, a similar shower accompanied by rain, fell at Agra, a shower of blood at Furruckabad and likewise at Meerut previously, also a dark spot observable on the disc of the sun.

Besides the recent shock of an earthquake slightly felt here, there was an unnatural yellow fog or darkness of some duration followed by a violent Wind storm which lasted from 3 P. M. to 5 P. M. one afternoon early in the present month. These were all more or less strange phenomena. After the fall the largest piece found was said to weigh about 4 maunds.

6. The following extract from a letter from Dhurmsala on the same subject had been also received.

" What a terrific meteor we had yesterday! It burst over Dhurmsala. First there was a loud explosion, and then the stone broke into fragments; one falling near the Barracks and sinking 6 feet into the ground,another below the Kotwallee on the Noorpore Road, and a third in the lines. Two men came running up with some bits in their hand, and gave me one. It is a light grey colour, and hard as iron. The stone when found was cold as ice. The noise was fearful and unearthly, followed by long reverberations, the ground trembling as well as the air. The heat was fearful all day. Ther. 89°. Major ——— heard the noise when sitting inside his tent at Kangra, and he thought one of the towers had fallen. The guddees were much frightened and carried off every bit of the stone to do pooja to it. Capt. ——— saw it whirling along in the air and so did the Bisaladar who described it as like a pine tree, which I remember was the illustration used by Pliny, when describing the eruption of Vesuvius 1800 years ago, when Pompeii was destroyed. Other fragments of stone fell in other parts of the district, and beyond it at Madoopore. The piece of stone to

be sent, (dawk banghy) was one inside bit, the outside pieces bearing marks of combustion. Before the 14th the weather for several days was excessively close and hot at Dhurmsala and all over the country."

7. The Secretary also read the following extract of a letter from Mr. Oldham, containing a communication from Dr. Haidinger of Vienna on the subject of the meteorites lately sent to the Imperial Museum, Vienna, by the Society.

Naini Tal, August 27th, 1860.

My dear Atkinson,—I have had notes from Dr. Haidinger, Vienna, regarding the meteorites. I suppose from what he says that you have had a letter of thanks, but in case it should have miscarried, I write to tell you the box arrived safely, on 22nd May, and that they are greatly pleased and gratified with this addition to their valuable series of meteorites. Dr. Haidinger's first note stated that several of the specimens had been placed in the lapidary's hands and were then being polished. And now in his second note, just received, dated 30th June, he gives me the result of some of their analyses. Many public duties connected with proposed changes in the organization of some of the scientific bodies of Vienna, with the object of economy, had occupied Dr. Haidinger's time and energies more than he wished, and he regrets in consequence the little progress he has made in the description of these interesting specimens. Of one however he has laid an account before the Imperial Academy of Sciences (Vienna) on the 8th of June. In this he gave a brief account of the whole six meteorites sent to Vienna. The specific gravities of these are:—

Allahabad,	3.526
Shalka,	3.412
Segowlee,	3.425
Assam,	3.792
Pegu,	3.737

(The Pegu specimen was sent by me, not by Asiatic Society.) These do not differ materially from each other, and yet the specimens differ very materially so as to give an almost complete series of meteoric productions, perhaps the class of the Cape or Rokkeveld meteories excepted.

The Shalka meteorite appeared the most rare and curious. It was

carefully analysed by Herr Charles Von Hauer, Chemist to the Imperial Geologieal Institute, who found the following contents;

Silica, ...	57.66
Alumina, ...	a traee.
Protox. of Iron, ...	20.65
Lime, ...	1.53
Magnesia,.....	19.00
	98.84

In the analysis of Mr. Piddington of the same meteorite, the magnesia had eseaped him and remained with the iron, which has been now prevented owing to the later improvements in Chemical Analysis. Von Hauer found the oxygen of the bases to the oxygen of the acids in the ratio of 1 : 2,42 or between bisilicates and trisilicates. Dr. Haidinger says: "Stromeyer already had found a somewhat analagous ratio in an olivine-like body inelosed in a meteoric iron from Saxony. Professor Shepard had given the name of Chladoite to a real trisilicate eontained in the Bishopsville meteorites. This eertainly new speeies in the Shalka meteorite, I thought it my duty to name Piddingtonite, in eommemoration of that really indefatigable labourer in Natural Sciences to whom we owe the reseue of that most remarkable meteorite of Shalka, and in eommemoration too, of the kindness with which you aeeeded to our proposals of exchange."

Dr. Haidinger adds that he was engaged in the further investigation of the speeimens sent and he hoped to forward a series to the Society from their eollections.

When the proceedings of the Academy of Vienna for June arrive, I would suggest that a translation of the valuable aeeount given by Dr. Haidinger of this meteorite should be published in the Journal. I have only given a few of the heads of the notiee.

Dr. Haidinger sends two eopies of their more reeent eatalogues of meteorites, and begs me to hand you one for Asiatie Society.

I inclose it, you will see that all the Soeiety sent have been embodied in this. The large mass of iron from the Kurruckpur Hills was considered as by ourselves doubtfully meteoric, but we shall soon have the result of the eareful analysis.

It may be interesting to the Society to give them a few results at their next meeting, so I send them to you at once, and the specific gravities could be with advantage attached to the specimens in your collection.

I hope we shall be able to procure some specimen of the great mass said to have fallen at Dhurmsala lately.

In the absence of Mr. Obbard his paper on the translation of waves of water with relation to the great flood of the Indus in 1858, was read by the Secretary.

Archdeacon Pratt made some valuable remarks which have been printed at length in the Journal.

Mr. Temple made some interesting observations on the character of the Indus at Attock and the effects of the flood as pointed out to him by Captain Henderson on the spot shortly after the event.

Some discussion ensued on the wave theory as applicable to the phenomena of the flood, in which Sir Bartle Frere, Mr. W. T. Blanford and the Secretary joined.

On the motion of the Chairman the thanks of the meeting were voted to Mr. Obbard and Archdeacon Pratt for their valuable communications.

Major W. S. Sherwill read an interesting paper upon some remarkable Waterspouts, that had been observed by him lately in and near Calcutta; he stated that it was his intention merely to put on record the fact of these curious bodies having been seen, together with the dates of their appearance, times of duration, size and direction of their movements, in the hope that the notes might assist any future enquiries into the nature of the laws regulating these phenomena; as up to the present moment, as Major Sherwill observed, no satisfactory theory has been advanced, that serves to connect these phenomena with the general law of Physics.

The immediate cause of the paper read was the appearance upon the 11th of August last, of two, very perfect and large Waterspouts that appeared, the one between Dum-Dum and Calcutta, the other crossing the Hooghly river opposite to Sulkea. The former was perhaps more than a thousand feet in length, of a pale blue colour, depending from a heavy rain cloud; the upper portion of this im-

mense column gyrated in a rapid manner until, no longer able to contain itself, it burst into a heavy shower of rain. The Waterspout that crossed the river agitated the water beneath it considerably, but did no damage. This body was bent into an elegant double curve like the letter S. by counter currents of light wind; this Waterspout from its light colour and from its great beauty attracted much attention.

Major Sherwill then described a group of twenty Waterspouts that were seen by him whilst surveying the Darjeeling territory. These extraordinary Phenomena were seen to form over the mountain Tonghoo, 11¼ miles from Darjeeling. A diagram showing this wonderful group was exhibited and claimed the attention of the meeting.

Other diagrams of variously formed waterspouts were also exhibited and described. These notes with reduced diagrams will be published in the Journal.

The thanks of the meeting were voted to Major Sherwill for his interesting descriptions.

Baboo Rajendralal Mitra made some remaks on the appearance of a waterspout in the direction of Howrah witnessed by himself on the same day.

The Librarian submitted his usual monthly reports for the months of August and September last.

Library.

The following additions to the Library were made during the months of August and September, 1860.

Presented.

General Report on Public Instruction in the Lower Provinces of the Bengal Presidency for 1858-59 with Appendixes.—By the Director of Education.

Nyt Magazine fur Naturvedenskaberne, Vol. X. part 4 Vol. XI. part I.—By the Academy.

Selections from the Records of Punjab Government, Vol. V.—By the India Government.

The Philosophical Magazine for July, 1860.—By the Editors.

Address delivered at the Anniversary Meeting of the Geological Society of London.—By the Society.

Selections from the Records of Travancore, Part I.—By the Government.

Proceedings of the Academy of Natural Sciences of Philadelphia for January and February, 1860.—By the Academy.

Journal of the Academy of Ditto, New Series, Vol. IV. P. 3.—By the Same.

New York State Library for 1855.—By the Same.

Ditto ditto State Law Library for 1855.—By the Same.

Ditto ditto State Bibliography, 1858.—By the Same.

Ditto ditto State Maps, MSS. Medals, &c. 1856.—By the Same.

The Cathedral of Throndheim.

Al-Mufussal opus de re grammatica Arabicum.—By J. P. Broch.

Karlamagnus Saga ok Kappa hans.—By the Christiania Academy.

Forlandlinger Videnskabi Selskubet.—By the Same.

Tilottama.—By M. M. S. Dutt, Esq.

Quarterly Journal of Geological Society for May, 1860, No. 62.—By the Society.

Selections from the Records of Madras Government Report on the Agricultural Exhibitions in the Provinces for 1859, No. 64.—By the Madras Government.

Memoirs of the Geological Survey of India, Vol. II. P. I.—By the Geological Museum.

Journal Statistical Society of London, Vol. XXIII. P. II.—By the Society.

Oriental Baptist for July and August, 1860.—By the Editor.

Oriental Christian Spectator for June and July, 1860.—By the Editor.

Calcutta Christian Observer for August and September, 1860.—By the Editor.

Journal Asiatique, Tome. XV. No. 58.—By the Society.

Journal of the Indian Archipelago, New Series, Vol. III. P. I.—By the Editors.

Proceedings of the Royal Geographical Society of London, Vol. IV. No. 2 1860.—By the Society.

Jahrbuch, Vol. X. No. 4.—By the Academy.

Annual Report of the Geological Survey of India and of the Museum of Geology for 1859-60.—By the Govt. Geological Museum of Calcutta.

On the Importance of Physical Education.—By the Author.

On the Rise and Progress of Rational Medical Education in Bengal, being an Introductory Lecture, delivered on the 15th June, 1860.—By Dr. Eatwell.

Descriptions of a Defaced Fragmentary Human Skull, found in an Ancient Quarry-cave at Jerusalem.—By Dr. Meggs.

Athenæum for May and June, 1860.—By the Editor.

Purchased.

The American Journal of Sciences and Arts for May, 1860.

The Annals and Magazine of Natural History, Vol. V. No. 30, and Vol. VI. No. 31.

The Annales des Sciences Naturelles, Vol. XII. Nos. 2 and 3.

Comptes Rendus, Vol. L. Nos. 19 to 26, and Vol. LI. No. 1.

Journal des Savants for April and May, 1860.

Index ditto for 1859.

Revue des Deux Mondes for 15th April, 1st May, 15th May, 1st June, 15th June and 1st July.

Revue de Zoologie, Nos. 4, 5 and 6, 1860.

Conchologia Iconica, Parts 194 to 198.

Zamie Nafaarul Uns.

Goldstucker's Dictionary Sanskrit and English.

Sanskrit Wörterbuch Dritter Theil Bogen, 24—30.

For October, 1860.

The Monthly General Meeting of the Asiatic Society was held on the 3rd inst.—

A. Grote, Esq., President, in the chair.

The Proceedings of the last Meeting were read and confirmed.

Presentations were received—

1. From Mr. R. F. Saunders, specimens of the aerolite which fell at Dhurmsala, an account of which was submitted at the last meeting. The larger piece was picked up in the lines at Dhurmsala, and the smaller at Bowarna, about 20 miles to the east of Dhurmsala.

2. From Mr. H. Scott Smith, Registrar Calcutta University, a copy of the Calendar and Minutes of the Senate for the last 3 years.

3. From J. H. Gurney, Esq., M. P., Norfolk, a small collection of bird skins.

4. From Major H. L. Thuillier, a copy of Simm's new map of Calcutta, and two Indian Atlas sheets, Nos. 112 and 113.

The following gentlemen duly proposed at the last meeting, were balloted for, and elected ordinary members:—

J. E. L. Brandreth, Esq., Commissioner of Delhi; Moonshee Ameer Ally Khan Bahadur, Pleader of the Sudder Court; E. B. Harris, Esq.; John Christian, Esq., (for re-election) and C. G. Wray, Esq., C. E.

The Council report the following nominations to fill the six vacancies on the list of Honorary Members.

1st.—Dr. Albrecht Weber, as one of the most eminent Sanskrit scholars of Germany. He has particularly devoted himself to the study of the White Yajur Veda, and he has the enviable distinction of having edited an entire series, comprising the Sanhita of the Hymns, the accompanying Satapatha Brahmana, and the Ritual Sutras of Katyayana. Beside this great work, his four volumes of Indische Studien abound with new and valuable information in reference to the Vaidic period of Hindu literature.

2d.—Edward Thomas, Esq., as the author of valuable papers in our Journal and in those of the Royal Asiatic and Numismatic Societies, on several series of Asiatic medals, and more especially on those series which contribute to the early history of India; and as the editor of Prinsep's Indian Antiquities.

3rd.—Mons. Stanislas Julien, whose researches in the history and antiquities of China have raised him among the most distinguished Orientalists of the present day. His contributions to the *Journal Asiatique* are numerous and of great interest. Among his separate publications may be noticed his Travels and Life of Hiouen Thsang; Mengtsieu, vel Mencius inter Sinenses philosophus; *L' Histoire du Cercle de Craie*, and *Le Livre des Recompenses et des Peines.* They are works of consummate erudition, and any one of them is sufficient to establish the character of a scholar.

4th.—Dr. Aloys Sprenger, as an Arabic scholar of celebrity and as a valuable contributor in that capacity to early Mahommedan history, and as now engaged on what promises to be the best extant biography of Mahommed.

5th.—Dr. Robert Wight as a valuable contributor to our knowledge of Indian Botany, and more especially of that of the Peninsula and the Neilgherries.

6th.—Colonel George Everest, Fellow of the Royal Society, formerly of the Bengal Artillery, Surveyor General of India, and Superintendent of the Great Trigonometrical Survey of India from 1823 to 1843 and Surveyor General 1830 to 1843. Of the many important works executed under Col. Everest's direction, the most important and that by which he will be best known to posterity is the northern

portion of the Great Meridional Arc of India comprised between the Damargida and Dehra Dhoon Base lines $11\frac{1}{2}$ degrees in length, the account of the measurement of which was published by himself in 1847. The whole Indian Arc is equal to 21°, 21′, 16″, or about 1469 miles. No geodetic measure in any part of the world surpasses, or perhaps equals, in accuracy this splendid achievement. By the light it throws on researches into the figure and dimensions of the earth, it forms one of the most valuable contributions to that branch of science which we possess, whilst at the same time, it constitutes a foundation for the geography of Northern India, the integrity of which must for ever stand unquestioned.

Col. Everest reduced the whole system of the great national Survey of India to order, and established the fixed basis on which the geography of India now rests. His determination of the amplitudes of the two Northern sections of the great Meridional Arc by means of simultaneous observations taken to the same stars with counterpart circular instruments, and his method of determining the celestial azimuth, still practised, may be considered the most perfect modes of obtaining an astronomical element known to science.

The following gentlemen were named for ballot at the next meeting.

W. A. D. Anley, Esq. Assistant Engineer in the East Indian Railway, proposed by Capt. Layard and seconded by the President.

Captain C. D. Newmarch, Chief Engineer, Pegu, and Captain Horace Browne, Assistant Commissioner, Pegu.

E. O. Riley, Esq., Magistrate of Rangoon, proposed by Lieutenant Colonel A. Phayre, and seconded by the Secretary.

Baboo Degumber Mittra, proposed by Baboo Ramapersaud Roy, and seconded by Baboo Rajendralal Mittra.

Reverend K. M. Banerjee (for re-election,) and

R. T. H. Griffith, Esq., proposed by Mr. Cowell, seconded by Mr. Atkinson.

Communications were received—

1. From Mr. W. T. Blanford, "Notes on a Collection of land shells made in Upper Assam by J. W. Master, Esq., Assistant Commissioner of Golughat, with descriptions of a new species of Spiraculum, &c."

2. From Baboo Radha Nauth Sikdar, "An abstract of Meteorological observations taken at the Surveyor General's Office in the months of February and March last."

3. From Rev. I. Löwenthal, Peshawur, "A paper on the Non-Semitic character of the Pushto language."

This paper was read to the meeting by the Secretary.

The Librarian submitted his usual monthly report for September last.

For November, 1860.

The Monthly General Meeting of the Asiatic Society was held on the 7th instant,

The Ven. Archdeacon J. H. Pratt, as Senior Member, in the chair.

Presentations were received—

1st. From Professor Griffith, through Mr. W. Halsey, a singular iron sun-dial called *Pratoda* or *Pratola*, (serving also for an hour-glass a gun and a spear) believed to have been made by Sirdar Lena Singh for Lord Hardinge.

2nd. From the Royal Geologieal Soeiety of London, the 29th Vol. of their Journal.

3rd. From A. Sconce, Esq., the following Arabic Books :—Willmet's Arabic Lexicon, Schultens's Hariri and De Saey's Arabie Grammar, and Niebuhr's Travels.

4th. From the Editors of Rajah Radhakant's Subda Kulpadrúma the 1st No. of the new edition of the Encyclopedia, together with a brief sketch of the Rajah's life.

5th. From Baboo Kaliprasuno Singh the 2nd No. of his valuable work "Púrana Sangraha," being a Bengalee translation in prose of the "Mahabharat."

The *Pratoda* (noted above) was accompanied by the following extract from an old Hindoo work on astronomy, eommunicated by Pundit Bapu Deva.

1. I am explaining the instrument ealled *Pratoda* (a goad) invented by Ganesa, by which the hour of the day can be easily known. Take a straight stick of moderate thickness of the tree ealled Dalbergia Sisu, of any length.

2. Make it of the form of a right prism whose ends should be regular polygons having as many angles as the number of *ghatikas* eontained in the excess of the longest day above the shortest (at the given place) ; and for the convenience of holding it join a chain (or string) to its top : (and mark the numbers of *ghatikas* from that of the *ghatikas* of the shortest day to that of those of the longest on the upper parts of the sides of the prism sueeessively.)

3. Below its support, in order to place a gnomon, make holes in each side of the prism at the beginning of its length in such a manner that they may not touch each other in the middle (of the prism).

4. In order to conceal the gnomon (in this instrument) make *another* hole near the support (of the prism) at its top in the middle. Let the length of the gnomon be such as after placing it in the hole (made in each side) the length of its external part be nearly equal to the sixth part (of the length of the prism).

5. A twelfth part of the length of the external portion of the gnomon should be considered an *Angula* (a digit) in this *Pratoda* instrument. And find the sines of the (sun's) zenith distance and altitude at the end of each of the given *ghatikas* (from the sun-rise of every day, the number of the length of which is marked on the instrument) by the rule mentioned by former Astronomers.

6. The sine of the (sun's) altitude (found at the end of the given *ghatikas* from sun-rise) multiplied by 12 and divided by the sine of the zenith distance (of the sun found at the same time) gives the number of digits belonging to the given *ghatikas*.

Thus find the digits belonging to the given *ghatikas* one, two, &c., from sun-rise (of every day, the length of which is marked on the instrument) and mark these digits on the respective sides (of the prism) from the hole.

7. (When you want to know the time after sun-rise at the given day) place the gnomon in the hole of that side (of the prism) on which the number of the *ghatikas* contained in the length of the given day are marked, and hang the instrument by holding it in the chain in such a manner that the shadow of the gnomon falls on the side. And reckon the *ghatikas* (on the side) from the hole to the end of the shadow. These *ghatikas* are after sun-rise (when you observe the shadow) before noon, (but when you observe it) after noon they are the *ghatikas* remaining (to complete the whole day.) (This holds then when the end of the shadow falls exactly on the mark of the *ghatikas*) but when it falls between two marks, there will be required a proportion."

The Archdeacon then gave the following account of its character and uses :—

"The instrument appears to be roughly graduated and to be in a

ricketty condition. It has nine sides. If these are *exactly* suited to the latitude, the place for which it was made was in latitude 27° 56′ or thereabouts. If the latitude of the place did not accord with an *exact* number of sides, then it must have been between 26° 40′ and 29° 12′ that is, corresponding to $8\frac{1}{2}$ and $9\frac{1}{2}$ sides. Delhi lies between these last two latitudes. The instrument may, therefore, have been made for that city.

"The manner of using the instrument appears to be this. Suppose the day that you use it is the one of which the length is 50 minutes longer than the shortest day; then as $50 = 2 \times 24 + 2$ and 24 minutes make a *ghatika*, you must screw the gnomon into the hole in the third side, in which the figures run down the third shortest length. Then hang up the instrument and turn it round, thus hanging, so that the shadow of the gnomon may fall on the length of the instrument; the extremity of the shadow will point out the hour of the day in *ghatikas* from sunrise or sunset as it is before or after noon.

"The instrument is certainly curious, though of no particular scientific value."

Colonel Baird Smith communicated to the meeting the following interesting particulars respecting the constructor of the dial.

"Lena Singh Majeteeah, the constructor of the *Pratoda* Dial, was the representative of a well known distinguished Sikh family. He did not take any very prominent part in the Sikh campaign, but his brother Runjoor Singh commanded the Khalsa army at the battle of Aliwal where, as all know, he was signally overthrown by the force under Sir Harry Smith. On that occasion an exquisitely beautiful battery of six field guns, the property of Lena Singh, and the produce, probably, of the same workshops which produced the *Pratoda* Dial, was captured. Nothing could surpass the whole design and details of these guns, and while they were ornamented with great taste, they were at the same time good working guns, and had been vigorously used during the day.

"Lena Singh had very considerable mechanical capacity. He enjoyed greatly hearing of all forms of mechanical invention. The long range and explosion shells for guns were favorite subjects of experiment and discussion with him, and he was altogether a notable man among his race, and in his position as a Sikh Chieftain of large pos-

sessions, having strong intellectual tendencies in spite of the semi-barbarism amid which he lived."

The following gentlemen, duly proposed at the last meeting, were balloted for and elected Honorary Members :—

Dr. Weber.	E. Thomas, Esq.
M. St. Julien.	Dr. R. Wight.
Dr. A. Sprenger.	Col. G. Everest.

The following gentlemen who were proposed at the last meeting were also balloted for and elected ordinary members.

W. A. D. Anley, Esq., Assistant-Surgeon, East Indian Railway.

Captain C. D. Newmarch, Chief Engineer, Pegu.

E. O'Riley, Esq., Magistrate, Rangoon.

Captain Horace Browne, Assistant Commissioner, Pegu.

Baboo Degumber Mitter, Zemindar.

Reverend K. M. Banerjee for re-election.

R. T. H. Griffith, Esq., Benares.

The following gentlemen were named for ballot at the next meeting :

F. Cooper, Esq., C. S., proposed by the President, and seconded by the Secretary.

Moulavee Abdool Luteef Khan Bahadur, Deputy Magistrate and Deputy Collector, 24-Pergunnahs.

Babu Gooroo Churn Doss, Deputy Magistrate, Jessore, proposed by Babu Rajendrolal Mittra and seconded by Mr. Cowell.

D. H. Macfarlane, Esq., Calcutta, proposed by H. Woodrow, Esq., and seconded by C. G. Wray, Esq.

A note from Dr. F. Mouat announcing his intention to withdraw from the Society was recorded.

The following report was read from the Council on a recommendation from the Philological Committee :—

Report.

The Council recommend to the Society the acceptance of Mr. F. E. Hall's offer to edit the *Dasa Rupaka* (text and commentary) in the *Bib. Indica*. This work is the oldest authority for the dramatic system of the Hindus, and is also of great interest from the numerous quotations which are found in it. Mr. Hall has a very old MS. which will serve as the basis of his text. The work will occupy about

two fasciculi, and Mr. Hall will add a translation of the text and an introduction.

The recommendation was adopted by the Meeting.

A communication was received from Babu Radha Nauth Sickdar, being an abstract of Meteorological observations taken at the Surveyor General's office for the month of April last.

Mr. H. F. Blanford read a paper on the subject of Dr. Bronn's work on the laws of development of organised beings.

Mr. Blanford stated that the work, a brief notice of which he proposed bringing before the Society, was written by Dr. Bronn in 1855, in answer to a series of prize questions proposed by the French Academy of Sciences in 1853-4. Dr. Bronn's work was adjudged as successful and crowned by the Academy in 1857 and the work itself published shortly after. Its object was to ascertain the laws of the development of organised beings in time, a question which the recent publication of Mr. Darwin's work had rendered one of general interest, and the work possessed this great merit as evidence in the discussion provoked by Mr. Darwin, that having appeared long before the publication of Mr. Darwin's views, it was unbiassed in its conclusions by any controversial spirit.

The objects of Dr. Bronn's work differed in so far from those of Mr. Darwin's, that the former sought simply to determine the formal laws expressing the nature of the sequence of organisms in time and the relation of that sequence to the parallel sequence of geologic changes, while the latter endeavoured to solve the higher problem of which these formal laws are merely consequences, *viz.* the *modus operandi* of the cause to which the succession of varying organisms in past times is due. Dr. Bronn's objects bear the same relation to Mr. Darwin's as those of Kepler and Copernicus, the discoverers of the laws of the Heliocentric Planetary System did to Newton's, the discoverer of gravitation.

Of the two parts into which Dr. Bronn's Essay was divided, *viz.* the exposition of the laws of development; and the proving of these laws by the comparison and analysis of tabular evidence, only the first could be noticed in the brief space of a single lecture. Mr. Blanford's object was simply to bring to the notice of the Society, the general results at which Dr. Bronn had arrived, and would refer

those who might wish to enter in detail into the question, and satisfy themselves of the soundness or unsoundness of Dr. Bronn's views, to the original work, which had been published in German, French and English, the latter translation by the Ray Society of London.

The two fundamental laws laid down by Dr. Bronn as having regulated the sequence of organisms from the earliest period to the present time were :

1. That there had been the operation of an independent producing power or force (Kraft) progressive in intensity and in its sphere of operation.

2. That the results of this power or force had been limited by, and dependant upon, the nature and changes of the external conditions of existence, such as climate, habitat, food, &c.

With respect to the first law, a clear idea of the meaning of progression could only be gathered from a consideration of the whole range of organized beings, and the evolution of general propositions concerning form, organization, and habits of life. In this way, it was shewn that the criteria of higher types as compared with lower were :—

Higher.	*Lower.*
Bilateral symmetry of form.	Quadrilateral or circular symmetry of form.
Few homologous parts.	Numerous homologous parts.
Organs various, specialized to discharge one or few functions, concentrated, and enclosed.	Organs few, fitted to perform various functions, dispersed, and superficial.
Habits terrestrial.	Habits aquatic.
Breathing air.	Breathing water.
Food, (in the case of animals) vegetable.	Food, (in the case of animals) animal.

With respect to the second law, the conditions of existence might be considered under two heads, viz. as :—*inorganic*, which bore reference to terrestrial phenomena, such as temperature, climatal zones, the composition of the atmosphere, and the distribution of land and sea ; and *organic*, which included the supply of food, a consideration which had been developed to an extent unanticipated by

Dr. Bronn in Mr. Darwin's well known chapter on the "Struggle for Existence."

The hypothesis to which we had to apply these conditions was, that of an originally fluid globe, cooling by radiation, until a solid crust had formed, upon which the greater part of the water had condensed in the form of seas, while the atmosphere contained a larger proportion of aqueous vapour and carbonic acid than at present.

The excess of carbonic acid was subsequently fixed in the form of limestone, and eliminated, especially during the coal period, by the luxuriant vegetation which abstracted the carbon stored up in the coal formed of its remains. The carbonic acid since converted into coal and limestone had been calculated by Brogniart and Bischof to amount to 6 per cent. of the entire atmosphere, or one hundred times its actual proportion; and although it is probable that it never reached this amount, and that much of it was evolved from the interior of the earth through volcanic vents, contemporaneously with its absorption by the vegetation of the epoch, still, it had been proved by the experiments of Daubeng and Regnault, that a proportion of 5 per cent. of carbonic acid was by no means injurious to ferns, and that provided sufficient oxygen were present, animals could live without apparent inconvenience in an atmosphere containing half its volume of the former gas. The surface of the earth being then in such a condition as to support animal and vegetable life, we might expect, according to Dr. Bronn, the following series of phenomena, which, ranged in parallel columns exhibit the historic interdependence of the organic and inorganic kingdoms.

1. The simultaneous appearance of plants and animals, to sustain a proper relation in the components of the atmosphere,	1. When by condensation and chemical absorption the atmosphere became fitted to support life.
2. An universal and continuous change in the fauna and flora of the earth,	2. As the temperature universally and continuously diminished.
a. The primary fauna and flora were universal and tropical,	*a.* The temperature of the earth's surface was likewise uniform and tropical, until,

b. becoming subsequently diversified according to climate.

3. New forms of life could not have arisen from those preceding them, but were provided for by a new creation. (Schöpfung). The assumption of specific and generic centres, is therefore unnecessary and improbable.

4. As the older forms disappeared, in consequence of the cooling of the earth and the formation of continental areas, they were continuously replaced by new forms with but a slight variation in the intensity of the producing force.

5. The general character of the first fauna and flora was entirely different from that of the present day, the passage being, however, gradual throughout.

6. Organisms became more varied and respectively adapted to more diversified conditions of life.

7. The appearance of most plants and animals was conditional on the previous fulfilment of the conditions necessary for their existence, as regard nourishment, habitat, &c.

8. The absolute number of species, genera, and families increased with the differentiation of

b. the internal heat being diminished by radiation, the climate became differentiated in different zones.

3. The new stations formed were not always in connexion with those previously populated.

4. The cooling of the earth's surface and the extension of continental land areas proceeded gradually and equably.

5. The physical condition of the earth's surface was likewise originally very different from that of the present day, and the passage gradual.

6. In consequence of the above change, stations became more numerous and varied.

7. The Earth, having become peopled with such plants and animals as depended solely on each other and on the purely terrestrial conditions, was, by their existence, rendered habitable for succeeding races.

8. The differentiation of the requisite external conditions proceeded continuously, but espe-

external conditions.

9. The tendency of all successive changes may be termed terripetal. The first population of the globe was almost exclusively pelagic. Land animals succeeded, and increased most rapidly both in numbers and in perfection of organization.

10. The higher and more perfect plants and animals are, so are the conditions requisite for their existence more complicated and numerous. The more perfect animals could not exist without the less perfect. And thus a necessary consequence of the progressive development of the earth's surface, was a gradual higher development of the organic world as a whole, as well as of its subordinate divisions, and while the organic world tended more and more to the formation of the existing higher types, the latter tended to increase in a more rapid ratio than the less perfect. Meanwhile many of the less perfect either simply disappeared or were replaced by more perfect compensating forms.

11. There are also some special cases in which the progression of the organic world towards a higher degree of development, cially characterized the close of the carboniferous epoch and the commencement of tertiary times.

9. Simultaneous and parallel with these changes was the diminution and sub-division of watery areas and the formation of continental, as distinguished from insular divisions of the land area.

10. The external conditions of existence became more varied and fitted for the existence of higher organisms.

either generally and systematically, or specially from embryonic types, appears to have progressed, independently of any apparent external causes, and in accordance with the operation of some independant internal law, except in so far as there is a necessary reciprocal relation between the laws of development of the organic and inorganic world, which could only be definitely expressed if we knew the nature of the power or force which gives rise to new organisms.

In commenting on the above, Mr. Blanford remarked that although the hypothesis of a cooling globe and an universal equable temperature in early geologic times had been rejected by Sir Charles Lyell and some other eminent authorities, there were many important facts, such as the existence of a coal flora within the Arctic regions in a great measure identical with that of the temperate zone, and the wide distribution of generic and specific types in Palœozoic times, which gave much probability to the hypothesis upon which Dr. Bronn's theoretical conclusions were based.

These views were stated necessarily at much disadvantage before the Society, as time would not permit of even an abstract of Dr. Bronn's proofs of the laws above enunciated, by a review of the geologic record, which could be the only test of their truth or falsity. With respect to the third of Dr. Bronn's secondary laws, viz. that new stations were frequently isolated, and consequently that their faunas and floras were necessarily of independent origin, it appeared to Mr. Blanford that both the fact and inference were pure assumption, and neither proved by the author in the subsequent part of his work, nor indeed very capable of historic proof. Many of the now isolated stations, such as the islands of Polynesia, had been shewn to be very probably mere remnants of former widely extended stations; (in the case cited, by Dr. Hooker on botanic

grounds and by Mr. Darwin on geological grounds;) and even were it granted, as it might be theoretically, that such isolated stations may occasionally have been formed, until we can ascertain the period at which they were first populated, and can assert that no possible accidental transport of eggs, seeds, &c. would account for that population, the inference drawn by Dr. Bronn would be by no means legitimate.

In some other points, it appeared that Dr. Bronn had laid too much stress upon negative evidence as e. g. in the ninth of the secondary laws, but as this had no important bearing on the principal object of the paper, viz. a comparison of Dr. Bronn's laws with Mr. Darwin's theory of natural selection, it need not be further alluded to.

Setting aside the assumption of independent faunas and floras, as unproved in any case and at variance with the tendency of our present knowledge, the laws evolved by Dr. Bronn were stated to be in close accordance with the requirements of Mr. Darwin's theory. With respect to the formal portion of Dr. Bronn's first fundamental law, (i. e. the fact of progression, apart from any hypothesis of a force,) very little had been said by Mr. Darwin; his only reference to it being to the following effect, viz.:—the higher forms have their organs more distinctly specialized for different functions; and as such division of physiological labour seems to be an advantage to each being, natural selection will tend in so far to make the later and more modified forms higher than their early progenitors, or than the slightly modified descendants of such progenitors.* This view appeared to be identical with that taken by Dr. Bronn in the majority of cases, as enunciated in Nos. 7, 8, 9 and 10 of his secondary laws. In No. 11, indeed something more is indicated, viz. a progression of type, independent, or apparently independent of external conditions, and referred somewhat vaguely to an unknown force; but this was scarcely necessary, and the phenomenon of progression according to embryonic types, the progression from general to specialized forms, which had been admitted by Agassiz, Owen, Carpenter and others, as having obtained in past times, was perfectly and most simply explained by Mr. Darwin's theory.

* Origin of species, p. 336.

Dr. Bronn's second fundamental law, the correlation of the development of organized beings, with that of the external conditions of life, and the multiplication of varieties and species as these conditions became more varied, formed one of the fundamental requirements of Mr. Darwin's theory.

The chief point on which the two authors were at issue, was that of the origin of new forms. On this subject, Dr. Bronn did not enunciate any theory, and in the expression of his formal laws, referred vaguely to an undefined force. He denied, however, the possibility of their origin by descent, with variation, from pre-existing forms, as well as their origin by spontaneous generation from inorganic matter, and regarded that by immediate act of creation repeated for every new species, as inconsistent with the tenor of our knowledge of all natural operations. It was difficult therefore to understand how and upon what, the hypothetical force could be supposed to act, nor was this anywhere suggested in the essay. The objection by anticipation to Mr. Darwin's views, rested as it appeared, solely on the assumption of isolated stations before alluded to, and if this be rejected as unsound, there appeared nothing in Dr. Bronn's laws at all irreconcileable with Mr. Darwin's theory. For the rest Mr. Darwin had suggested a *vera causa* and it remained for the naturalist and geologist to say how far it was sufficient to account for the facts.

Some discussion arose after the lecture was concluded.

Dr. Kay remarked, that the way in which the subject had been treated, appeared to him calculated to produce serious confusion of thought. There had been a perpetual vibrating between two entirely distinct inquiries ; the search into *forms* and the search into *causes*. A great deal of fallacious reasoning was owing to the neglect of this distinction. Morphology was a deeply interesting study ; but it gave absolutely no information about the causes of the differential characteristics observed in analogous species of plants and animals at successive epochs. In examining such species it was natural to use such words, as *advance*, *progression*, &c. ; but these terms simply mean that the species of a later era are found to differ in certain ways from those of an earlier era. The morphological progression proves nothing as to the existence of an œtiological connexion between the

successive stages. It is simply a historical fact that there is an advance in the observed forms. But to state a fact is not to account for it, and Moliére's physician added nothing to science when he averred that medicine cured because it possessed a *vis medicatrix*. All present were aware that theories such as Dr. Bronn's or Dr. Darwin's had a far wider and deeper interest than they would have simply as scientific speculations, because they touched on questions relating to man's spiritual nature. That nature enabled man to look upward to the eternal, and downward to the endless variety of cosmical phenomena. Would any similarities of structure between man and other contemporary or palœozoic species bridge over the chasm placed between him and them by the possession of that spiritual nature ? If it be said that the power of ulterior development had existed from the date of the primal monad,—this would only increase a billion-fold any difficulties that may be supposed to lie in the received theories of creation ;—for, whence came this monad ? It must have been created. And what a marvellous creature ! to hold shut up within it the numberless forms of all the species that have arisen in the world through countless ages, along with all the laws of their successive development, each one involving such marvellous adaptations to all other portions of the Kosmos !

He would add an expression of his hearty concurrence with two remarks made by the lecturer :—*viz.* where he spoke of the rashness with which his author theorized on the early geological periods ; and where he stated his belief that Dr. Bronn's assumption of a mysterious " Kraft" or power was neither legitimate nor very intelligible.

Mr. Blyth rose, as the friend of Mr. Darwin of more than a quarter of a century standing, to advocate his theory. He expatiated upon the vastness of geological periods, as amply sufficient for bringing about the present order of things in the organic kingdoms, by the operation of Mr. Darwin's principle of Natural Selection. The immensity of the lapses of past time he illustrated by comparing them with the profundities of space, and by the computed distances of sundry astronomical objects. He also argued a far higher antiquity than is generally supposed for the existence of the human being upon this planet, as testified by the discoveries of Dr. Lund in certain low caverns in Brazil, more than twenty years ago, and abundantly by

recent discoveries in various regions: more especially he referred to certain tumuli in Scania, where flint arrow-heads or spear-heads were found together with the bones of extinct mammalia, and associated also with human remains, the skulls of which indicated them to belong to the hyperborean type of mankind, being similar to those of modern Esquimaux; an important fact, which tended, as he thought, to connect the epoch of those remains with the glacial era of Agassiz, or at least with the time when the Rein Deer and the Musk Ox roamed over what is now Britain. But he maintained that however ancient may be the remains of this hyperborean race in modern Scania, perhaps one of the present American types of humanity in the New World, still, for various reasons adduced, we must look to the tropical regions of the major continent for the aboriginal habitat of the human being; countries of which the palæontology is almost utterly unknown. Mr. Blyth then adverted to the incompleteness of the geological record as insisted upon by Mr. Darwin; and touched upon some other points, which the lateness of the hour prevented his dwelling upon.

Mr. Blanford briefly replied to remarks which fell from Dr. Kay, that he had not professed to enter upon the subject of causation at all; but only upon the study of forms as indicating the direction which causation had taken.

The interesting discussion was closed by the Chairman, stating that the thanks of the meeting were due to Mr. Blanford for laying before them the views of Dr. Bronn. He observed that a comparison had been made by Mr. Blanford between the progress of this new or newly-revived theory of the mutability of species and the establishment of the theory of universal gravitation. But he would remark that in the establishment of the theory of gravitation there had been two grand stages, the second of which was far longer and more laborious than the first. The first was the conception of the law, the second was its verification. In the second, as well as the first Newton did a vast deal himself, but it had been the work of the last 200 years to complete the demonstration, so long as nearly 100 years after Newton the celebrated Clairant had been staggered by an error in the moon's motion, which at first he could not explain on Newton's theory, and went so far as to suggest that the law varied partly as the inverse square and partly as the inverse fourth power of the dis-

tance. So lately as the time of Laplace similar difficulties had presented themselves, which his sagacity alone had removed. But now such perfection had been attained that as the instruments of observation and the method of calculation are from time to time improved, the smallest variations detected in the motions of the heavenly bodies are explained, and the theory of gravitation, as applicable to the minutest particles of matter, fully established. He added that in this new theory of the mutability of species Mr. Darwin seems to have taken the first step in striking out a bold generalization. But the more laborious and lengthy process of testing his law has yet to be gone through, and when completed as satisfactorily as that of gravitation, he (the Chairman) for one would believe in it as a law of nature.

With reference to remarks which fell from Mr. Blyth regarding the incompleteness of the geological evidence, he recommended to his notice two papers in *Fraser's Magazine* for June and July, by Mr. William Hopkins of Cambridge, well known as a first rate mathematician and geologist. He thought these papers were among the most thoughtful and convincing replies to Mr. Darwin's whole theory that he had read.

A vote of thanks was then passed to Mr. Blanford for his lecture.

The Librarian submitted his usual monthly Report for October last.

LIBRARY.

The following books have been added to the Library since November last.

Presented.

Journal of the American Oriental Society, Vol. VI. No. 2.—BY THE ORIENTAL SOCIETY.

Burges's Trans. of Surya Siddhanta.—BY THE AUTHOR.

Report on the Survey operations in the Lower Provinces, for 1858-59. —BY THE AUTHOR.

Oriental Christian Spectator for September and October 1860.—BY THE EDITOR.

Journal of the Statistical Society of London, Vol. XXIII. Part III.—BY THE SOCIETY.

Proceedings of the Zoological Society of London, Pt. II. of 1860.—By the Society.

Ditto, of Royal Society of London, Vol. X. No. 39.—By the Society.

De Sacy's Arabic Grammar, Vol. I. Pt. II.—By the Author.

Willmet's Lexicon Linguæ Arabicæ Niebuhr's Voyage en Arabie, Vol. I. Pt. II.—By A. Sconce, Esq.

Ditto, descriptions del' Arabic Schultens Harriri, Vol. I. Pt. II.—By the

Williams F. F. Guide to Indian Photography.—Report on the Teneriffe. astronomical experiment of 1856 addressed to the Lord Commissioner of the Admiralty, London.—By the Lords Commissioners.

Monthly notices of Royal Astronomical Society of London, Vol. X. Part III.—By the Society.

The Life of Rajah Radhakanta Deva Bahadur.—By the Editors.

Sabda Kalpadruma in series, No. 1.—By the Editors.

Report on the result of the Administration of the Salt Dept. 1858-59, Bengal Govt.—By the Bengal Govt.

Oriental Baptist for November 1860.—By the Editor.

Calcutta Christian Observer for Nov. 1860.—By the Editors.

Trans. of the Bombay Geographical Society, Vol. XV.—By the Society.

Bengali Translatiou of Mahabharata, Pt. II.—By the Editor.

Selections from the Records of Government of India For. Dept. No. 28, By the Government.

Memoirs of Royal Astronomical Society, Vol. XXVII.—By the Society.

Exchanged.

Zeitschrift der Deutschen Morgenlendischen Gesellschaft, Pt. VIII.

Athenæum, for August, 1860.

London and Edinburgh Philosophical Magazine, No. 132, for September, 1860.

Purchased.

The Literary Gazette, Nos. 112 to 115.

Comptes Rendus, Nos. 6 to 9 Tome 51.

Revue des Deux Mondes, Tome XXX. for 15th August and 1st September, 1860.

Annales des Sciences Naturelles, Tome XII. No. 56, 1860.

Journal des Savants for July and August, 1860.

Revue de Zoologie, Nos. 7 and 8, 1860.

The Annals and Magazine of Natural History, Vol. VI. No. 33.

Flugels die classen der Hanefitischen Rechtsgelehrten.

Foncause Buddhar.

Capt. Raverty's Gulshan-rah—Afghan Poetry and Prose.
Ditto. Dictionary of the Pushto or Afghan language.
Ditto. Grammar, Ditto. Ditto.

For December, 1860.

At a meeting of the Society held on the 5th Instant—

A Grote, Esq., President, in the chair.

Presentations were received—

1st. From Major Hollings, a baked clay fac-simile of Sanscrit inscription on a stone pillar in the Behar Fort.

2nd. From the Bombay Geographical Society, the 25th Vol. of their Transactions.

3rd. From Mr. W. S. Seton-Karr, Secretary to the Government of Bengal, forwarding, on behalf of the India House, certain copies of the Memoirs and Reports of the Royal Astronomical Society.

4th. From the Academy of Natural Sciences at Philadelphia, a copy of the proceedings of the Academy for 1860.

The Secretary announced the publication of the Shell catalogue, a copy of which was laid on the table, price fixed at 3 Rs. a copy.

The following gentlemen who were proposed at the last meeting were balloted for and elected ordinary members.

F. Cooper, Esq. C. S.

Moulavie Abdool Luteef Khan Bahadur, Deputy Magistrate and Deputy Collector, 24-Pergunnahs.

Baboo Gooroo Churn Doss, Deputy Magistrate, Jessore.

D. H. Macfarlane, Esq., Calcutta.

The following gentlemen were named for ballot at the next meeting.

J. C. Erskine, Esq. proposed by Sir Bartle Frere and seconded by Captain W. N. Lees.

Lewis Jackson, Esq. C. S. proposed by Mr. Atkinson and seconded by Mr. Cowell.

William Thompson Dodsworth, Esq., Surveyor, Ganges Canal, Dehra Dhoon, proposed by Colonel Waugh and seconded by Major Thuillier.

Notes from the following gentlemen intimating their wish to withdraw from the Society were recorded.

Messrs. A. K. Dyer, H. V. Bayley and F. A. Goodenough.

Communications were received—

1. From Major H. L. Thuillier, forwarding copy of a letter as follows from Colonel Waugh, Surveyor General of India, containing further information relative to the fate of the late lamented Mons. A. Schlagintweit.

Surveyor General's Field Office,
Dehra, 13th November, 1860.

From Lieut.-Col. A. S. Waugh,
Surveyor General of India.

To Major H. L. Thuillier,
Deputy Surveyor General of India,
Calcutta.

Sir,—Adverting to correspondence marginally cited,* I have the honor to transmit herewith a letter in original No. 380 .901 of 3rd instant, with enclosures, just received from Captain T. G. Montgomerie, Engineers, 1st assistant G. T. Survey, in charge of the Kashmir series, conveying information which he has recently obtained relative to the fate of the lamented Mr. Adolphe Schlagintweit.

* No. 940, dated 19th July, 1859, from Secy. to the Govt. of India, Mily. Dept. to my address.
My reply to the above No. 42.409 of 29th July, 1859.
Also my letter in continuation No. 62.576 of 28th Sept. 1859.

I beg you will be good enough to forward these papers for submission to Government, and also take such steps as may be necessary to make their contents known to the Asiatic Society, which has already recorded such particulars as have been hitherto gathered on the subject.

Office of the Kashmir Series,
Camp Kartarpore, 3rd November, 1860.

To the Surveyor General of India.

Sir,—With reference to my letter No. 500 of 23rd August, 1859, I have the honor to enclose a Persian document* concerning the fate of Mr. A. Schlagintweit.

* In original.

This document is apparently written by one Mahomed Ameen of Yarkand, who was in Mr. S.'s service at the time of his murder. He

mentions having sent two letters round to the West by Peshawar and says that he has received no answer. Col. Edwardes received one of the letters and it is printed in the collection of Official Reports circulated by the Messrs. Schlagintweit. Vide No. 10 in the list.

A small leather bag accompanied the letter; the bag contained four very thin old copper coins and an instrument for cutting leather, with an awl, the two latter I understand to be of the kind used by Bhistees.

The letter does not throw any new light on Mr. Schlagintweit's fate and does not entirely agree with the letter sent to Col. Edwardes but, being of a later date, it may be interesting. The writer says he has not managed to secure either the boxes or the property of the unfortunate Mr. S.

I enclose the statement made before Mr. Civil Assistant W. H Johnson by Kunj Khan of Yarkand, the bearer of Mahomed Ameen's letter, who says he was taken into Mr. S.'s service the day before he was imprisoned and declares he was present when Mr. S. was murdered. This man states that Mr. Schlagintweit's property is in the possession of Shaidarwag of Badakshan and that it includes a large folio of drawings and other papers. Kunj Khan thinks that the property might be recovered.

I did not myself see Kunj Khan and have not the means of forming an opinion as to his veracity or as to the feasibility of the plan he proposes. The man was given a present and told that a suitable reward would be given for any drawings, papers, or other property recovered. The folio is no doubt the most valuable. Just before leaving the Hills, I heard that Lieutenant-Colonel Irby of H. M.'s 51st foot had met another man from Yarkand with Mr. Schlagintweit's skull. As to the truth of this I have not as yet heard. The hopes of reward are no doubt, likely to produce a good number of impostors. During the hot weather I heard that Mr. S.'s bones had been carried into Kuta.

I propose forwarding the bag with copper coins, &c., to the care of Major H. L. Thuillier. I will of course avail myself of every opportunity that there may be to get further information on the subject. Should any be forthcoming I shall again address you.

(Sd.) T. G. Montgomerie, *Capt. Engrs.*
First Asst. G. T. Survey of India.

STATEMENT OF KHUNJ KHAN OF YARKAND.

Mr. Schlagintweit left Leh with seven servants, viz., Mahomed Ameen, Yarkandi, Abdul, Kashmiri Kitmadgar, Moorad Jood, Caubuli, (who remained at Yarkand and is still there) Hoshir and Ali from Skeardo, and Tashi and Bhots of Shashot village. Mr. S. first visited Yarkand and afterwards Kashkar; on his arrival at the latter place he found the Kokanies at war with the Kashkar people. The Kokan troops were commanded by Wali khan. Mr. S. sent Mahomed Ameen to Wali khan to obtain permission to go to Kokan; Wali khan replied that if Mr. S. would take Kashkar and the Chinese fort first he would allow Mr. S. to go to Kokan. Mr. S. told him he could not take Kashkar without troops and guns, this made Wali khan vexed, upon which Mr. S. and all his servants were imprisoned by Wali khan, who took all Mr. S.'s property. The day after their imprisonment Mr. S. the two Baltis and two Bhots were murdered by Wali khan. The other two servants, Mahomed Ameen and Abdul were to have suffered the same fate, only the approach of a Chinese Army made the Kokanies retreat. Mahomed Ameen and Abdul went afterwards to Kokan and complained to the Rajah Kodayar, who was very angry with Wali khan and intended to have sent him a prisoner to Lahore to meet his punishment, but at this time Mali khan assisted by Wali khan raised an insurrection and expelled the former ruler Kodayar. When Kodayar intended seizing Wali khan the latter gave charge of all Mr. S.'s property to Shaidarwag of Badakshan; after Kodayar went away to Bokhara, Wali khan went to recover the property but did not; subsequently Mali khan, the new ruler of Kokan, went with an army of 20,000 troops but was defeated by Shaidarwag, with whom Mr. S.'s property is to this day. The property has not been removed from the place where it was first put, and may be obtained by sending a sharp man to Shaidarwag with presents, &c. A man in Leh, by name Tulsiram, is willing to try and get the property if he is assisted.

The two servants Mahomed Ameen and Abdul were well treated by Kodayar, but not so by Mali khan, upon which Abbul left for Peshawar 14 months ago, viâ the Samarkand route. Mahomed Ameen remained in Kashkar.

With Mr. S.'s property there are a great number of drawings and other papers in a large folio which Khunj Khan saw Mr. S. open.

Mahomed Ameen, is an old man, being hardly able to work ; he says if he got some money he could purchase a horse and come down to Lahore if wanted.

Note by Mr. Johnson.—The above was taken down as given by Kunj Khan, who was present when Mr. S. was murdered, and it is in some measure confirmed by a letter which has been sent by Tulsiram's brother from Yarkand.

I hear that the Moonshi who was sent from Simla or Kooloo never went beyond Leh and therefore got no correct information.

(Signed) W. H. Johnson,
Civil Assistant G. T. Survey.

Camp Leh in Ladak, 11th September, 1860.

عرضداشت کمینه جاکرجان نثار محمد امین باي کاروان باشي یارکندي
به خدمت صاحبان غریب پرور عدالت گستر دولت بهیه انکلیسیه
انکه احوال پیره غلام درتاریخ غره ربیع الاخر درولایت کاشغر بموجب
صبر است و چشم امید این پیره غلام همیشه در راه است که بلکه ازان
جانب خبري یاکه خط که باعث بر خوشوقتی باشد برسد هیچ معلوم
نشد تاکه درین ایام یکی از چاکران که از سابق پرورش یافته دست
خود این پیره غلام بوده وبسخن و مطلب این جان نثار محرم است
گویا مثل فرزند خود دانسته روانه خدمت کرده فرستادم که بعد از بار
یافت حضور صاحبان نامبرده را به اندک زمانی مرخص نموده معه
انچه فرمایشات ده ازان جانب حکم شود خط کرده بدست نامبرده
فرستاده انشا الله انچه که از دست این پیره غلام براید در طریقه
جان ثناري کوتاهي نخواهد شد دیگر معروض غلام انکه از گذارشات
گذشته تا حال بست و دو خط ازین طرف به پا یه سریر دولت معروض
داشته فرستاده ام یکی را بجواب سرفراز نشدم ندانم که ان صاحبان
صاحب داعیه را چه در خاطر که هیچ در جواب عریضجات غلام وباز
یافتی از احوال صاحب مقتول نه پرداخته چشم پوشی نمودند اگر
غلام خارج طریقه وآئین صاحبان میباشم ویا خدمت من منظور نشد
انصاحب مقتول در وفاداري و خدمت کاري و خیر خواهي دولت
وآبروي هم کیشان ملت خود که صاحبان دولت باشند از سر و جان
خود به نا امیدي گذشت ازان چرا چشم پوشیدند حقوق جان ثناریش
همین بود خبر احوال باشد صاحبان صاحب اختیار اند بعد از اظهار

در د والم و مصیبت رسید کی این عاجزان معروض خدمت میشود
که بازهم از احوال گذشته انکه بعد از انکه در کاشغر خراب آباد از بد بختی
خود بے صاحب و صاحب اختیار شدیم مدت بیست و چهار روز را
در زندان خواجه ظالم بودیم قطع حیات خود کرده منتظر آنکه این
ساعت یا ساعتی دیگر ما را هم مثل آقای ما خواهند کشت اینکه
لشکر خطای رسیده و خواجه ظالم گریخته دران فرصت هرکس به اعمال
خود گرفتار این پیره غلام از زندان بر آمده فرار سمت خوقند گذاشته
بهزاران مشقت خود را تا ولایت خوقند رساندم مدت هشت ماه را
در خوقند بودم و ازان جا عبدل نام که خوانسالار صاحب مقتول بود
ان را اسپ و خرچی داده خط کرده از راه کابل و سمت پیشاور
فرستادم و خود از بعضی احتیاط که خدا یار خان حاکم خوقند گریخته
برادرش ملا خان ولایت را در تصرف آورده بود از خوقند برامده
ولایت روش که مشهور به تخت سلیمان است بین راه خوقند وکاشغر
دران ولایت پناه گرفته مدت هشت ماه را هم دران ولایت بسر بردم
از هر سمت که اهل تجار روانه ان ولایت میشد خط کرده میفرستادم که
باشد از جانب صاحبان به این بے صاحبان احوالی برسد تا اینکه خط
مراد یهودي رسید که بر خواسته خود را به کاشغر برسان که مطالبات
نربد دست آمد سه چهار خط که فرستاده این پیره غلام بر خواسته در
کاشغر آمدم که ازان مطلب ها هیچ در دست نیامده لا علاج مراد
یهودي را براه انداخته فرستادم و خود به اتفاق میرزا عبد الوحود
خان هراتی که نکلسین صاحب درپشا ور آن را بدین امر حق درقید کرده بود
محرر همین عریضه باشد شب و روز جویاي احول کتاب هاي صاحب
واستخوان هاي ان مقتول میباشم شاید که لطف خداوند شامل شده ازگم
شده خود نشاني بیابیم واحوال مراد یهودي چنان معلوم شد که در یار
کند ماندني شده است دانسته پیره غلام هنوز نشد که چرا در یار کند
مانده است این جا اسپ واخرا جاتش بهر طریقه که بود تمام کرده
بودم در امر سفرش تا تمامي نبود دیگر تا بعد از این حالی شود از
سبب ماندن مراد کنجه خان را که حامل عریضه میباشد به پایه سریر
دولت سرفرازش نموده فرستادم امیدوارم که به زودیش مرخص
فرمایند که تا برگشت کنجه خان این پیره غلام در کاشغر چشم امید
در راه میباشم و منظور غلام آنکه بهر طریق فرمایش بشود غلام همچنان

بحان کوشیده بهمان طریق عمل نمایم و اگر فرمایش صاحبان در طلبیدن پیره غلام باشد همراه دو پسر خود از راه خرپره یا مرسر فرار حضور فراهم شد خوفی که در دل پیره غلام میباشد از تبت است و دیگر از احوال پیره غلام کنجه خان مخبر است که خانه معه اسباب خانه بتاراج رفت وکم بیش که از هر جانب تردد کردیم ان را هم برشوت و پاره بهرکس که رسید مضایقه نکردیم شاید که از گم شده کان خود نشانی بیابیم شب و روز به اتفاق مرزای مذکور که ذکرش در بین عریضه شد جو یای احوال مطالبات هستم تا خداوند چه لطف کنند زبانی کنجه خان انچه معروض دارد مخبر احوال است و دیگر احوالات که درین ولایت میباشد قبل بر این خبر معلوم شد لشکر آروس به بالای اور کنج آمد ودراین روزها را باز احوال رسید که لشکر قلبلي آمده باز برگشت راه دور است تا معلوم شود و امیر دوست محمد خان کابلي لشکرش ولایت قندوز را گرفته در تصرف دارد تا بعد ازین چه کند گویا از گرفتن قندوز بدخشاني وگولابي و حصاري این هرسه ولایت اتفاق کرده خیال جنگ را دارد تا چه شود و از سمت آق مسجد هم لشکر آروس آمده است و تدارك بسیاري از غله و قورخانه آورده ومي آرد و از سمت قزل هم جاي است که بسمت هشترخان هم می رود و بختن هم مي رود بخوقند هم می رود ازان طرف هم لشکر آروس به تدارك تمامي آمده است قزاق و قرقز همه تابع شدند و ثانیا معروض پیره غلام انکه کاروان تبت را هم درین روزها کنجونی زده غارت کرده است یك خط بدست سید افغانی از احوالات خود پیره غلام وثانی احوالات بهمان کاروان کوه فرستاده شد اگر سید افغانی درکاروان زدئی باشد خط نرسیده باشد واگر بدیگر کاروان باشد انشا الله منظور خواهد شد باقی ایام دولت بردوام باد *

2. From Dr. Carter, the concluding portion of his report on Geological specimens from the Persian Gulf collected by Captain C. G. Constable, the former portion of which was published in the first No. of the last year's vol. of the journal.

The Secretary read the above papers to the Meeting.

The thanks of the Meeting were voted to Dr. Carter for his interesting contribution.

The Librarian submitted his usual monthly report for November last.

Report of Curator, Zoological Department, for April and May Meetings.

The following presentations have now to be recorded.

1. From J. H. Gurney, Esq. M. P., Catton Hall, Norwich. A series of beautifully prepared skeletons already mounted, *viz.* :—

Mammalia.

European Fox (Vulpes vulgaris).
Polecat or Foumart (Mustela putorius).
Badger (Meles taxus).
Seal (Phoca vitulina).
Hedgehog (Erinaceus vulgaris).
Water Vole (Arvicola amphibia).

Aves.

Great Black-backed Gull (Larus marinus).
Goosander (Mergus merganser).
Black-throated Loon (Colymbus arcticus).
Puffin (Fratercula arctica).

The whole of the above being new to the museum as perfect skeletons, though it possesses an incomplete skeleton of the Seal.

Also British examples of three species of birds (skins), for comparison with their Indian representatives ; *viz.* the Quail, the common Snipe, and the European Little Grebe or Dabchick.

The large or common Indian Quail is considered as a particular race by Mr. Gould ; while the late Mr. Yarrell, on comparing specimens of Quails from Europe, India, and S. Africa, expressed his opinion that they were identical. In the examples now compared, the only difference that I can perceive consists in the fact, that our Indian Quails were killed during the cold season, with more newly moulted plumage ; while the British examples were as obviously killed during the summer, when their feathers had been longer worn.

The same remark applies to the Snipe.

With regard to the Little Grebes of the two regions, there seems to be more of white at the bases of the *remiges* in the Indian race (P. philippensis, Scopoli) ; but it may be doubted if this be constant, and a Chinese example is intermediate.

2. M. Zill, travelling naturalist. A fragment of the egg-shell of the huge extinct Dodo-like bird of Madagascar, EPIORNIS MAXIMUS, Is. Geoff.,—an egg beside which that of the Ostrich is comparatively diminutive, and which is stated to hold about two gallons.*

3. Donor unknown. Skin of LAGOMYS ROYLEI, from Tibet.

4. Major G. G. Pearse, commanding 3rd Sikh Irregular Cavalry, Sigouli. Skin of HÆMATORNIS CHEELA, in semi-adult plumage.

5. Rája Rádakhánta Deb, Bahádur. A large specimen of TRYGON MARGINATUS, Blyth; referred to in a note to p. 38 *antea*.

6. Capt. Jethro Fearweather, late commanding the ship 'Forfarshire.' Skull of DELPHINUS EURYNOME, Gray, from the Bay of Bengal. A very beautiful and perfect specimen.

7. Mrs. Edwards. A fish in spirit, from Port Blair, Andamáns. It is a SERRANUS, one of several species which are uniformly dotted over with small white spots; but it has not hitherto been identified satisfactorily. (D. 9/17—*A.* 3/8.)

8. Capt. E. Fowle, of Rangoon, through Capt. Niblett, commanding the 'Sydney' S. V. A small specimen of the curious crustacean, THALASSINA SCORPIONOIDES, Leach. Capt. Fowle writes —"The Burmese call it *Padzoon ken* (or 'Scorpion Prawn'). It does not live on the surface of the ground, but burrows to a depth of three or four feet. This specimen was found at that depth." It is occasionally though rarely brought to the Calcutta fish-bazars.

9. Bábu Gour Doss Bysack, Deputy Magistrate of Balasore. Skins of CHILOSCYLLIUM PLAGIOSUM and TRYGON IMBRICATUS.

10. Capt. Eales, of the 'Fire Queen,' S. V. A Dog-fish, 6 ft. long, from the Aguáda Reef, stated to be only found in shoal-water, and known to sailors as the 'Sun-fish.' It is evidently the NEBRUS CONCOLOR, Rüppell *(Ginglymostoma concolor*, Müller and Henle); but is stated by Capt. Eales to have been toothless! The skull has been completely removed from the specimen.

11. Mr. Blyth. A stuffed specimen of the rare RUPICOLA SANGUINOLENTA, Gould, *P. Z. S.*, 1859, p. 99. Inhabits Bogota.

* Here it may be remarked that the two types of Ostrich-eggs, from N. and S. Africa respectively, noticed by myself in *J. A. S.* XXVIII, 241, 282, and XXIX., 113, have likewise been remarked by the Rev. H. B. Tristram in No. V of Mr. Sclater's new Ornithological Journal *The Ibis*, p. 74.

I observe that the Chinese Pangolin is referred to MANIS JAVANICA by Mr. Arthur Adams, in the *P. Z. S.* for 1839, p. 133; and upon re-examination of the flat skin sent by Mr. Swinhoe, I find that Mr. Adams is right, and that I was incorrect in following the late Dr. Cantor (*Ann. Mag. N. H.* IX, 274), in assigning it to the Indian M. PENTADACTYLA in p. 93 *antea*.

With reference to my remark in *J. A. S.* XXIX, 493 (note), that I was unaware of the existence of any 'Susú (PLATANISTA) in the Burmese rivers, Lt.-Col. Blake, commanding at Schwe Gyen, writes word—"As regards the Porpoise, I have not been able to procure you one; but that they do exist in these rivers is certain. I have seen them tumbling over each other in the Irawádi, the Pegu river, and the Sitang, as high up as Sitang." The genus, however, remains to be ascertained, and the habit referred to of "tumbling over each other," is what I have never seen done by the Susú. Perhaps the following species is intended:—

A small cetal new to the Gangetic streams was brought to me on the 18th July, 1860.* It proved to be an adult male of—

NEOMERIS PHOCÆNOIDES, Gray, founded on the *Delphinus phocænoides*, Dussumier, *MS.*, Cuvier, *R. A.* I, 291, and *D.* et *Delphinapterus melas*, Temminek, of the *Fauna Japonica* (should these prove to be identical, as suggested with much probability by Dr. J. E. Gray, *Br. Mus. Catal., Cetacea*, p. 80). It appears that a skull in the Paris Museum, marked *D. phocænoides*, was brought from Malabar by Dussumier in 1837; "teeth $\frac{20}{19}$;" while the Japanese skull of *D. melas* in the Leyden Museum has "teeth $\frac{16}{16}$," according to Dr. Gray. In the Calcutta individual the teeth are $\frac{15}{17}-\frac{16}{18}$; the foremost pair in the lower jaw being situate *underneath* the next, and *transversely*, meeting at the tips. The fresh animal had so much the appearance of a young GLOBICEPHALUS (except in having no dorsal fin), that seeing it under rather adverse circumstances, in a violent downpour of rain, I mistook it for such as I had obtained in the corresponding month of the preceding year; so, not requiring another young GLOBICEPHALUS for the Society's museum, and being

* On reference to the date of this Report, it will be perceived that the above notice of the NEOMERIS is here interpolated, and rightly so, as I had the chance of noticing it on the present suitable occasion.

short of hands just then in the taxidermist's department, with two large animals in course of preparation, I made the specimen over to Dr. Crozier of the Calcutta Medical College. Under that gentleman's superintendence the entire skeleton has been prepared, which he has kindly made over to the museum of this Society; but, unfortunately, no external part of the animal has been preserved, though Dr. Crozier has made notes of its outward appearance and anatomy, from which he has kindly permitted me to extract the following. It indeed occurred to me that the specimen was of a more leaden black than I had observed in GLOBICEPHALUS INDICUS, with the throat and pectoral region conspicuously albescent.

Dr. Crozier notices it as "a Porpoise 5 ft. long, of a bluish-black or lead-colour over the whole body, a little lighter on the under surface, and a white tinge under the throat and around margin of lips; a round head, protruding more convex on tip of upper jaw; blow-hole on upper-part of head, between two rather small eyes; opening [of the mouth] transverse and concave anteriorly, on posterior margin a row of small teeth of equal size in each jaw; a pair of long pectoral fins or flippers; body rather flattened laterally, and along the back a slight groove or depression of skin, which rises to a ridge posteriorly, on which is scattered a double series of *squamæ* or ossicles recalling to mind those of a Shark. Tail-flukes 17 in. in diameter."

On dissection, the animal proved to be a fully adult male, with a general resemblance in structure to PHOCÆNA VULGARIS, and others of the great DELPHINUS series.*

* Dr. Crozier also dissected the young GLOBICEPHALUS INDICUS obtained by me last year from some fishermen, who caught it in one of the streams connected with the salt-water lake E. of Calcutta; its skeleton being now in our museum. He remarks of it—"A GLOBICEPHALUS $4\frac{3}{4}$ ft. long; with blow-hole single, on upper-part of head, transverse and concave anteriorly; no external ear or *meatus auditorius*; eyes very small, just behind and above the angle of the mouth; opening of eyelids oblong from before backwards; opening of mouth large, with a thick fleshy soft tongue; 7 or 8 teeth in each jaw, very small, just appearing above the gums, indicating that the animal had been born only a very short time. The whole of the body is of a dark bluish colour, and the skin covered over with very thin cuticle; there is a slight constriction between the head and the body; flippers a good deal elongated; a small dorsal fin about the hinder two-thirds of the length of the body; tail-flukes large and notched in the centre; in middle of body a longitudinal umbilical depression."

Judging from my own recollection, and also from the stuffed specimen, 9 ft. long, in the Society's museum, I should not state the eyes to be "very small," but of the usual size in the *Delphinidæ*. In the Susú (PLATANISTA) they are exceedingly minute. In the GLOBICEPHALUS of 9 ft., the milk-teeth are consi-

The following highly interesting communication, regarding the Great Rorqual of the Indian Seas, has been kindly communicated by the Hon. Sir H. Bartle Frere.

"The Indian Rorqual is very common still in the seas off the coast of Arabia and Mekran, Scind, Cutch, Kattywar; and the Rorqual fishery is still one of the many strings which a Yankee captain trading on those coasts is apt to have to his bow. During the calm weather from September to February these 'Whales' are very constantly seen by any vessel between Bhoy and Kurrachee; the captains of coasting steamers told me they saw them almost every voyage at that time of the year. I have myself seen them twice in the few trips I have made from Bombay to Scind, once very close,—and remarked the large dorsal fin. They are also not unfrequently seen from Manora (the entrance to Kurrachee Port) in a very calm afternoon in the autumn, their black bodies, and jets of breath being visible with a glass in the offing when there is a bright light on the water from the afternoon sun. I have notes of three 'Whales' having come ashore, two early in our tenure of Scind, and one while I was there. We found him out by the stench from his carcase, and on going to the spot (a few miles from Kurrachee) found him stranded and half devoured by the Hyænas, Jackals, and Sharks, many of which were tugging at portions of the carcase which floated. We collected most of the bones, and sent them to the Kurrachee museum, whence I will get a photograph of them, and if possible a few of the bones, which are frequently found on that coast. John Macleod, whom you may perhaps know by name as an amateur naturalist, calculated the length of the 'Whale' we found as about 65 or 70 ft.; but it was in fragments, and nothing to lead to identification but the bones."—

derably eroded, and a few of them had been shed, but without the tips of any of the permanent teeth appearing. The number of milk-teeth shewing above the gum would seem to have been $\frac{6-6.}{11-11}$ In the skeleton of the newly born young, there had been a series of at least 12 on each side above, and more below; but I can only give the former number as *in situbus veris*. Teeth of adult $\frac{7-7}{8-8.}$ In the newly born young, the atlas and axis vertebræ are already partially joined, the other cervical vertebræ being still separate: in the adult the series are anchylosed into one mass, the whole of these being united into a single obtuse peak above.

Doubtless the identical specimen mentioned as having been "stranded near Kurrachee" in *J. A. S.* XXIX, note to p. 482.

At the time that my memoir on the Great Rorqual of the Indian Ocean was published (Vol. XXVIII, 481 *et seq.)*, I had not seen Dr. J. E. Gray's British Museum Catalogue of *Cetacea* published in 1850. In that work Dr. Gray arranges the *Balænidæ* into four genera, thus—

"*A. Dorsal fin none. Belly smooth. Baleen elongate, slender.*

1. Balæna.

B. Dorsal fin distinct. Belly plaited. Baleen broad, short.

2. Megaptera. Pectoral fins elongate. Dorsal fin low.

3. Balænoptera. Pectoral fins moderate. Dorsal fin falcate, $\frac{2}{3}$ from nose. Vertebræ 46 or 48.

4. Physalus. Pectoral fins moderate. Dorsal fin falcate, $\frac{3}{4}$ length from nose. Vertebræ 54 or 64."

Now, if my cited authority regarding the great Rorqual of the Indian Seas be fully trustworthy, the dorsal fin of this animal "is about one-third or a little more from the head and is well developed;" which I take to mean from the setting on of the head, rather than from the extremity of the muzzle; though even this would place it nearly about the middle of the animal, or considerably too forward for either of the two genera with "falcate fin" recognised by Dr. Gray. Referring to an experienced whaler, who is familiar with the animal, he also states that "the fin is near the middle of the back, if anything rather backward." Further observation is required; as also respecting the number of vertebræ composing the entire series, the amount of *anchylosis* of the cervical vertebræ (or of junction or union of those that form the neck), the position of the sexual organs with reference to the dorsal fin, and likewise the dimensions of a specimen correctly taken, with those of its dorsal fin, flippers, and tail-flukes, the position of the eye, &c. &c., and above all a carefully executed figure is exceedingly desirable.

It appears that Sperm Whales (Physeter macrocephalus ?) are by no means uncommon off the coast of Ceylon, where, on the eastern side, my informant has seen a 'schule' of 30 or 40 within sight of land. They are also seen about Cochin, and thence across to Zanzibar, and especially about the Seychelles which is a noted

resort of the species. As a general rule, however, the Sperm Whale keeps to the open ocean, and is rarely observed in what seamen term 'narrow seas,' as the Bay of Bengal or Sea of Arabia even. My informant, who has been long engaged in the so-called 'fishery' for Sperm Whales, may be trusted as a safe authority for the species or genus.

Lastly, with reference to the remark of Nearchus (XXVIII, 481,) that the bones of Whales were, in his time, made use of for building purposes on the coast of Mekran, I may notice that they have also been thus used on the shores of the Polar Sea, at the N. E. extremity of Siberia. Thus Von Wrangell remarks that—"At many places along this coast we saw the bones of Whales stuck upright in the ground; our interpreter, and subsequently the Tschuktschi whom we met, said that they were the remains of the former dwellings of a stationary tribe. They appeared to have been of a better and more solid kind than are now used, and to have been partly sunk in the ground." And again—"There are traditions which relate that two centuries ago the Onkilon occupied the whole of the coast from Cape Schelagskoi to Behring's Straits; and it is true that there are everywhere along this tract the remains of huts constructed of earth and whale bones, and quite different from the present dwellings of the Tschuktschi." Von Wrangell's *Narrative of an Expedition to the Polar Sea (Sabine's translation*, 1840, pp. 360, 372.) E. Blyth.*

* Referring to the recent use of flint implements, in p. 384 *antea*, I have since read the following passage concerning the American red man, quoted in the *London Athenæum* for Sept. 15th, 1860, No. 1716, p. 346. "They dig their ground with a flint, called in their language *tom-a-pea-kan*, and so put five or six grains into a hole the latter end of April or beginning of May," &c. &c. Quoted from a reprint of *a Two years' Journal in New York, and part of its Territories in America*, by Charles Wooley, or Wolley, A. M. (about A. D. 1678). Of course a research into the narratives of the old navigators will disinter many instances of the kind, by those who have the leisure for it, among nations unacquainted with the use of metals.

Two stupid *errata* have crept into my memoir on Indian *Cetacea*. One (p. 486 *antea*) is in the extract from the *Friend of India* newspaper. For "diameter" read *circumference!* The other relates to the longitude of the Sulu or Mindoro Sea (p. 484), which rectify as being from 118° to 122° meridians E. of Greenwich.

NOTE BY THE EDITORS.

Mr. Freeling, when giving us a report on our Coin Cabinet, in May, 1857, suggested an appeal to the friends of the Society throughout India in the following words:

"In conclusion I would urge that all friends to the Society, among whom must of course be specially included all who themselves feel any interest in Indian numismatics, should be requested to aid in every mode in their power, so that the coin collection may be placed in that rank which would so well befit a Society whose Journal is the depository of the lifelong labours of James Prinsep."

He pointed out that our collection was very deficient in Bactrians, and, though this department has been since greatly enriched by our purchase of the Stacy Cabinet, it still wants many coins which might be supplied from the Punjab or from duplicates in private collections.

In Pathans of Delhi and in Moguls we have yet many blanks to be supplied, though our extreme poverty in these series is less conspicuous since the purchase above mentioned.

When our Cabinet shall have been properly arranged, a list of the duplicates in our possession which will be available for sale or exchange will be published in the Journal. We shall be glad to introduce into the same list any duplicates in private collections which their owners may wish to dispose of.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.616	29.661	29.550	0.111	82.9	88.6	80.2	8.4
2	.616	.661	.570	.091	82.6	87.8	80.7	7.1
3	.678	.730	.631	.099	82.3	87.8	79.4	8.4
4	.637	.692	.550	.142	82.9	88.4	80.0	8.4
5	*Sunday.*							
6	.672	.720	.629	.091	80.2	84.6	77.5	7.1
7	.667	.711	.595	.116	84.7	90.2	80.8	9.4
8	.651	.698	.590	.108	85.6	90.8	81.8	9.0
9	.638	.694	.577	.117	86.2	92.2	81.8	10.4
10	.624	.697	.541	.156	86.8	93.0	82.0	11.0
11	.552	.612	.454	.158	86.9	94.6	82.8	11.8
12	*Sunday.*							
13	.422	.521	.331	.190	85.6	90.5	82.4	8.1
14	.303	.368	.217	.151	86.9	93.3	80.2	13.1
15	.287	.348	.228	.120	86.4	91.6	82.0	9.6
16	.368	.438	.303	.135	88.4	96.8	83.8	13.0
17	.470	.524	.415	.109	87.7	94.8	82.6	12.2
18	.502	.556	.451	.105	85.1	90.6	81.4	9.2
19	*Sunday.*							
20	.246	.338	.152	.186	81.1	85.4	79.0	6.4
21	.233	.429	.059	.370	79.5	82.2	77.8	4.4
22	.494	.554	.419	.135	81.4	85.0	78.0	7.0
23	.558	.602	.521	.081	84.4	88.6	81.1	7.5
24	.585	.633	.533	.100	84.7	90.0	81.0	9.0
25	.603	.650	.556	.094	84.1	89.5	80.0	9.5
26	*Sunday.*							
27	.602	.655	.535	.120	83.4	89.4	79.9	9.5
28	.590	.663	.536	.127	83.6	88.5	81.0	7.5
29	.595	.643	.549	.094	85.5	91.1	80.8	10.3
30	.595	.637	.540	.097	86.1	91.0	82.2	8.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	79.6	3.3	77.9	5.0	0.937	10.06	1.73	0.85
2	79.4	3.2	77.8	4.8	.934	.03	.65	.86
3	79.6	2.7	78.2	4.1	.946	.17	.41	.88
4	79.6	3.3	77.9	5.0	.937	.06	.73	·85
5	*Sunday.*							
6	78.2	2.0	77.2	3.0	.916	9.89	0.99	.91
7	81.3	3.4	79.6	5.1	.989	10.58	1.84	.85
8	81.5	4.1	79.4	6.2	.983	.49	2.27	.82
9	81.3	4.9	78.8	7.4	.964	.29	.70	.79
10	81.6	5.2	79.0	7.8	.970	.33	.88	.78
11	81.9	5.0	79.4	7.5	.983	.45	.80	.79
12	*Sunday.*							
13	81.6	4.0	79.6	6.0	.989	.56	.20	.83
14	82.2	4.7	79.8	7.1	.995	.60	.65	.80
15	81.8	4.6	79.5	6.9	.986	.51	.55	.81
16	81.3	7.1	77.7	10.7	.931	9 88	3.96	.71
17	82.7	5.0	80.2	7.5	1.008	10.71	2.85	.79
18	81.1	4.0	79.1	6.0	0.973	.40	.17	.83
19	*Sunday.*							
20	78.3	2.8	76.9	4.2	.908	9.78	1.39	.88
21	77.7	1.8	76.8	2.7	.905	.77	0.89	.92
22	77.7	3.7	75.8	5.6	.876	.43	1.84	.84
23	79.9	4.5	77.6	6.8	.928	.93	2.38	.81
24	80.4	4.3	78.2	6.5	.946	10.11	.31	.81
25	80.4	3.7	78.5	5.6	.955	.23	1.98	.84
26	*Sunday.*							
27	80.0	3.4	78.3	5.1	.949	.18	.78	.85
28	80.1	3.5	78.3	5.3	.949	.18	.85	.85
29	80.8	4.7	78.4	7.1	.952	.17	2.55	.80
30	81.5	4.6	79.2	6 9	.976	.41	.54	.80

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.541	29.698	29.172	0.526	82.3	86.2	78.3	7.9
1	.530	.682	.162	.520	82.1	86.0	78.1	7.9
2	.527	.670	.149	.521	81.7	86.0	78.0	8.0
3	.508	.662	.140	.522	81.4	84.9	77.8	7.1
4	.510	.672	.135	.537	81.1	84.4	77.5	6.9
5	.518	.678	.125	.553	81.0	84.0	77.8	6.2
6	.537	.688	.115	.573	81.2	84.3	78.0	6.3
7	.550	.696	.091	.605	82.1	85.8	78.2	7.6
8	.560	.715	.059	.656	83.6	86.6	78.3	8.3
9	.572	.724	.166	.558	85.3	88.6	78.4	10.2
10	.575	.730	.205	.525	86.4	89.8	79.0	10.8
11	.570	.716	.230	.486	87.1	92.6	80.2	12.4
Noon.	.557	.705	.250	.455	87.9	93.2	80.8	12.4
1	.537	.690	.249	.441	88.3	94.6	80.8	13.8
2	.515	.668	.215	.453	88.7	96.6	80.5	16.1
3	.495	.642	.188	.454	88.1	96.6	80.5	16.1
4	.477	.641	.172	.469	87.6	96.8	79.9	16.9
5	.479	.631	.152	.479	86.6	95.8	79.6	16.2
6	.490	.634	.168	.466	85.6	92.6	79.6	13.0
7	.509	.663	.183	.480	84.4	88.8	79.7	9.1
8	.529	.691	.191	.500	83.7	88.3	79.6	8.7
9	.548	.705	.189	.516	83.4	87.8	78.6	9.2
10	.558	.712	.186	.526	83.1	87.4	78.2	9.2
11	.562	.708	.183	.525	82.9	86.6	79.6	7.0

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	79.7	2.6	78.4	3.9	0.952	10.23	1.35	0.88
1	79.3	2.8	77.9	4.2	.937	.08	.43	.88
2	79.4	2.3	78.2	3.5	.946	.17	.20	.89
3	79.0	2.4	77.8	3.6	.934	.05	.22	.89
4	78.8	2.3	77.6	3.5	.928	9.99	.18	.89
5	78.6	2.4	77.4	3.6	.922	.93	.21	.89
6	78.8	2.4	77.6	3.6	.928	.99	.22	.89
7	79.3	2.8	77.9	4.2	.937	10.08	.43	.88
8	80.2	3.4	78.5	5.1	.955	.25	.78	.85
9	81.0	4.3	78.8	6.5	.964	.29	2.35	.81
10	81.4	5.0	78.9	7.5	.967	.30	.76	.79
11	81.7	5.4	79.0	8.1	.970	.33	3.00	.78
Noon.	82.0	5.9	79.0	8.9	.970	.31	.33	.76
1	82.1	6.2	79.0	9.3	.970	.31	.49	.75
2	82.1	6.6	78.8	9.9	.964	.23	.73	.73
3	82.0	6.1	78.9	9.2	.967	.28	.44	.75
4	81.6	6.0	78.6	9.0	.958	.19	.33	.75
5	81.0	5.6	78.2	8.4	.946	.09	.05	.77
6	80.9	4.7	78.5	7.1	.955	.21	2.55	.80
7	80.5	3.9	78.5	5.9	.955	.23	.08	.83
8	80.3	3.4	78.6	5.1	.958	.28	1.79	.85
9	80.2	3.2	78.6	4.8	.958	.28	.68	.86
10	80.1	3.0	78.6	4.5	.958	.28	.58	.87
11	80.0	2.9	78.5	4.4	.955	.27	.52	.87

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	0.34	S. W. & E.	Cloudless till 5 A. M. Scatd. \i & _i till 9 A. M. cloudy till 6 P. M. Scatd. _i afterwards: also raining between 10 A. M. & 1 P. M.
2	..	...	S. E. & E.	Cloudless till 4 A. M. cloudy afterwards, also drizzling at 6 and 7 and 10 A. M. & at Noon & 3 P. M.; thundering and lightning at 3 P. M.
3	..	0.47	E. & S. E.	Cloudy; also raining between 1 & 3 & likewise between 10 & 11 A. M.
4	..	0.74	S. E. & S.	Scatd. clouds, also raining at Noon, also between 4 & 6 P. M.
5	*Sunday.*	2.96		
6	..	1.60	S. & S. E. & E.	Cloudy; also constantly raining.
7	..	0.26	S. & S. E.	Cloudy with rain at 1 P. M.
8	..	..	S. & S. E.	Scatd. _i till 6 A. M. Scatd. clouds afterwards.
9	126.2	..	S.	Cloudy till 7 A. M. Scatd. _i afterwards.
10	131.0	..	S.	Cloudless till 4 A. M. Scatd. _i till 4 P. M. Scatd. clouds afterwards.
11	131.6	..	S. & S. E. & E.	Scatd. clouds.
12	*Sunday.*	..		
13	..	0.36	N. E. & N.	Scatd. \i till 2 A. M. cloudy till 5 P. M. Scatd. _i afterwards; also raining at 8 A. M & between 10 A. M. & Noon.
14	..	1.08	N. & N. W.	Cloudy; also raining at 1 and 3 A. M. & also at 3 P. M.
15	..	0.19	W. & N. W.	Cloudy; also drizzling at 3 & 4 A. M. & between Noon & 1 P. M.
16	..	0.25	W. & S. W.	Cloudy; also raining at 7 & 10 P. M.
17	..	0.34	W. & S. W.	Cloudy; also raining at Midnight and 2 A. M. as likewise at 5 & 6 P. M.
18	..	0.39	S. W. & S.	Cloudy; also drizzling between 1 and 6 P. M.
19	*Sunday.*	2.41		
20	..	0.09	N. W. & N. E. & N.	Cloudy; also drizzling at 7 and 8 A. M. as likewise at 5 & 10 P. M.
21	..	0.28	N. & S. E. & S.	Cloudy; also drizzling constantly.
22	..	0.55	S.	Cloudy till 7 P. M. cloudless afterwards; also raining at Midnight 1 A. M. 11 A. M. Noon & 3 P. M.
23	..	..	S.	Scatd. clouds.

\i Cirri, _i Cirro strati, ^i Cumuli, ~i Cumulo strati, _i Nimbi, —i Strati, \i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
24	117.8	..	S.	Scatd. clouds; also very slightly drizzling at 1 A. M. & 11 P. M.
25	120.5	..	S. & S. W.	Cloudy.
26	*Sunday.*			
27	..	0.09	S. W. & S.	Cloudy; also drizzling between 1 & 2 A. M. & between 5 & 8 P. M.
28	..	0.08	S.	Cloudy; till 2 P. M. Scatd. ⌣i till 7 P. M. cloudless afterwards, also drizzling between 10 & 11 A. M.
29	124.0	..	S. W. & S.	Cloudless till 8 A. M. Scatd. ⌢i till 6 P. M. cloudless afterwards.
30	123.0	..	S.	Cloudless till 2 A. M. Scatd. ⌣i & ⌢i till 7 P. M. cloudless afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month, ...	29.532
Max. height of the Barometer occurred at 10 A. M. on the 3rd, ..	29.730
Min. height of the Barometer occurred at 8 A. M. on the 21st, ..	29.059
Extreme range of the Barometer during the month, ...	0.671
Mean of the daily Max. Pressures, ...	29.594
Ditto ditto Min. ditto, ...	29.463
Mean daily range of the Barometer during the month, ...	0.131

	o
Mean Dry Bulb Thermometer for the month, ...	84.4
Max. Temperature occurred at 4 P. M. on the 16th, ...	96.8
Min. Temperature occurred at 4 A. M. on the 6th, ...	77.5
Extreme range of the Temperature during the month, ...	19.3
Mean of the daily Max. Temperatures, ...	89.9
Ditto ditto Min. ditto, ...	80.8
Mean daily range of the Temperature during the month, ..	9.1

	o
Mean Wet Bulb Thermometer for the month, ...	80.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	4.0
Computed Mean Dew-point for the month, ...	78.4
Mean Dry Bulb Thermometer above computed Mean Dew-point, ..	6.0
	Inches
Mean Elastic force of Vapour for the month, ...	0.952

	Troy grains.
Mean Weight of Vapour for the month, ...	10.19
Additional Weight of Vapour required for complete saturation, ..	2.12
Mean degree of humidity for the month, complete saturation being unity,	0.83

	Inches.
Rained 20 days, Max. fall of rain during 24 hours, ...	2.96
Total amount of rain during the month, ...	12.48
Prevailing direction of the Wind, ...	S. & S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	3	1	1		5	2	1		9		1		2		2		2		
1	2		1		5	2	1		8	1	3	1	2		2	1	2		
2	2	1	1		4	2	1		9		4	1	2		1		1		1
3	2	1	1		3	2	1		11		3		3	1	1				1
4	1		1		3	1	2		10		3		3	1	1				2
5	1	1	3		2		1		11	1	3		2		2				1
6	2	1	3		3	1	1		11	1	3		2		1				
7	1	1	3		2	1	2		11	1	3		2		2	1			
8	2	1			5	1			14	1	2		2		1	1			
9	2				4	1			14		2		3		1				
10	2				1	1	2	1	13		3	1	3	1	2				
11	3	1			1	1	5	2	10	2	4		1	1	2				
Noon.	4	1	1		1		5	3	8	1	5		1		1				
1	2		1				7	2	11	2	3		2	1					
2	1		1				7		10	1	4		1		2				
3	2	1	1		2	1	6	3	10		3		1		1				
4	1		2		1		4	1	11	1	2		3		1				1
5	2		1	1			4	1	13	1	3	2	2	1	1				
6	2				2		3	1	12		4	1	2	1	1				
7	2		1		2		3		12		5	2			1				
8	2		1				4		12		4	1			1		2		
9	2		1		1	1	2		13		3		1				3		
10	1		2	1	1	1	2		13		3	1	1				3		
11	2		1		2		2		12	1	3		1						3

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.625	29.693	29.584	0.109	85.8	90.0	82.4	7.6
2	.678	.723	.627	.096	84.7	90.0	79.6	10.4
3	*Sunday.*							
4	.699	.744	.647	.097	85.8	91.2	82.0	9.2
5	.688	.751	.642	.109	85.4	91.8	81.8	10.0
6	.616	.677	.547	.130	87.3	94.0	81.8	12.2
7	.581	.648	.526	.122	86.5	93.8	79.6	14.2
8	.549	.588	.498	.090	88.5	94.1	84.4	9.7
9	.602	.667	.532	.135	88.1	94.0	83.4	10.6
10	*Sunday.*							
11	.685	.722	.622	.100	87.0	93.2	82.9	10.3
12	.716	.762	.651	.111	87.0	93.4	82.2	11.2
13	.703	.747	.638	.109	86.8	93.6	82.4	11.2
14	.683	.736	.625	.111	86.7	92.0	83.0	9.0
15	.646	.699	.582	.117	86.0	92.2	82.2	10.0
16	.590	.633	.524	.109	85.8	93.8	82.2	11.6
17	*Sunday.*							
18	.487	.548	.407	.141	87.6	94.8	82.4	12.4
19	.424	.485	.341	.144	84.9	89.4	82.0	7.4
20	.396	.464	.348	.116	84.0	88.2	80.9	7.3
21	3.98	.452	.322	.130	83.1	89.5	80.8	8.7
22	.461	.515	.403	.112	83.4	91.4	80.1	11.3
23	.464	.512	.402	.110	83.6	89.8	80.2	9.6
24	*Sunday.*							
25	.262	.339	.158	.181	85.0	91.6	81.0	10.6
26	.154	.257	.012	.245	81.1	85.8	77.8	8.0
27	.113	.446	28.721	.725	80.4	83.8	78 0	5.8
28	.490	.552	29.451	.101	83 7	87.8	80.1	7.7
29	.536	.581	.481	.100	85.7	92.0	81.4	10.6
30	.533	.586	.465	.121	85.9	90.9	82.6	8.3
31	*Sunday.*							

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	81.4	4.4	79.2	6.6	0.976	10.41	2.42	.81
2	81.1	3.6	79.3	5.4	.979	.48	1.94	.84
3	*Sunday.*							
4	81.5	4.3	79.3	6.5	.979	.44	2.39	.81
5	81.3	4.1	79.2	6.2	.976	.43	.25	.82
6	83.2	4.1	81.1	6.2	1.037	11.04	.37	.82
7	82.0	4.5	79.7	6.8	0.992	10.57	.53	.81
8	84.4	4.1	82.3	6.2	1.077	11.44	.44	.82
9	83.9	4.2	81.8	6.3	.060	.26	.46	.82
10	*Sunday.*							
11	81.3	5.7	78.4	8.6	0 952	10.12	3.17	.76
12	81.1	5.9	78.1	8.9	.943	.04	.25	.76
13	81.4	5.4	78.7	8.1	.961	.24	2.97	.78
14	81.1	5.6	78.3	8.4	.949	.12	3.06	.77
15	81.5	4.5	79.2	6.8	.976	.41	2.50	.81
16	81.5	4.3	79.3	6.5	.979	.44	.39	.81
17	*Sunday.*							
18	81.6	6.0	78.6	9.0	.958	.19	3.33	.75
19	81.4	3.5	79.6	5.3	.989	.58	1.91	.85
20	81.3	2.7	79.9	4.1	.998	.69	.48	.88
21	80.6	2.5	79.3	3.8	.979	.51	.35	.89
22	80.5	2.9	79.0	4.4	.970	.42	.54	.87
23	81.0	2.6	79.7	3.9	.992	.63	.40	.88
24	*Sunday.*							
25	81.1	3.9	79.1	5.9	.973	.40	2.13	.83
26	78.2	2.9	76.7	4.4	.902	9.72	1.45	.87
27	78.2	2.2	77.1	3.3	.913	.86	.08	.90
28	80.9	2.8	79.5	4.2	.986	10.57	.50	.88
29	82.3	3.4	80.6	5.1	1 021	.90	.90	.85
30	81.8	4.1	79.7	6.2	0.992	.59	2·28	.82
31	*Sunday.*							

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.543	29.726	28.933	0.793	82.9	85.6	78.2	7.4
1	.518	.723	.866	.857	82.8	85.0	78.8	6.2
2	.513	.719	.816	.903	82.5	85.2	78.8	6.4
3	.502	.704	.726	.978	82.2	85.0	78.8	6.2
4	.499	.698	.721	.977	82.1	84.7	78.8	5.9
5	.516	.708	.749	.959	82.0	84.6	78.8	5.8
6	.531	.728	.796	.932	82.0	84.4	78.0	6.4
7	.546	.737	.870	.867	82.7	85.0	78.6	6.4
8	.563	.754	.969	.785	84.4	86.6	78.0	8.6
9	.572	.758	29.064	.694	85.9	88.4	78.4	10.0
10	.572	.762	.140	.622	87.7	91.0	78.6	12.4
11	.564	.760	.183	.577	89.1	92.2	79.2	13.0
Noon.	.553	.745	.177	.568	89.6	93.2	80.9	12.3
1	.536	.723	.156	.567	90.1	94.0	80.6	13.4
2	.518	.710	.140	.570	90.3	94.1	82.8	11.3
3	.499	.680	.126	.554	89.6	94.8	82.2	12.6
4	.478	.651	.100	.551	88.3	93.6	81.2	12.4
5	.482	.670	.069	.601	87.4	92.1	79.9	12.2
6	.495	.685	.063	.622	86.4	90.4	80.4	10.0
7	.513	.700	.064	.636	85.2	89.2	79.5	9.7
8	.533	.718	.069	.649	84.4	88.2	78.9	9.3
9	.554	.737	.082	.655	84.0	87.4	77.8	9.6
10	.559	.740	.040	.700	83.6	86.6	78.8	7.8
11	.555	.738	.012	.726	83.3	86.8	78.8	8.0

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	80.5	2.4	79.3	3.6	0.979	10.51	1.28	0.89
1	80.4	2.4	79.2	3.6	.976	.48	.27	.89
2	80.3	2.2	79.2	3.3	.976	.50	.14	.90
3	80.0	2.2	78.9	3.3	.967	.41	.13	.90
4	80.0	2.1	78.9	3.2	.967	.41	.10	.90
5	80.0	2.0	79.0	3.0	.970	.44	.03	.91
6	80.0	2.0	79.0	3.0	.970	.44	.03	.91
7	80.4	2.3	79.2	3.5	.976	.48	.24	.89
8	81.0	3.4	79.3	5.1	.979	.48	.83	.85
9	81.6	4.3	79.4	6.5	.983	.47	2.40	.81
10	82.3	5.4	79 6	8.1	.989	.52	3.04	.78
11	82.8	6.3	79.6	9.5	.989	.48	.64	.74
Noon.	83.0	6.6	79.7	9.9	.992	.51	.82	.73
1	83.0	7.1	79.4	10.7	.983	.39	4.15	.72
2	83.3	7.0	79.8	10.5	.995	.51	.12	.72
3	82 9	6.7	79.5	10.1	.986	.45	3.88	.73
4	82.6	5.7	79.7	8.6	.992	.53	.27	.76
5	82.2	5.2	79.6	7.8	.989	.52	2.93	.78
6	81.7	4.7	79.3	7.1	.979	.44	.62	.80
7	81 4	3.8	79.5	5.7	.986	.53	.08	.84
8	81.1	3.3	79.4	5.0	.983	.51	1.80	.85
9	80.7	3.3	79.0	5.0	.970	.40	.77	.86
10	80.7	2.9	79.2	4.4	.976	.48	.55	.87
11	80.7	2.6	79.4	3.9	.983	.54	.39	.88

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	..	..	S.	Cloudless till 4 A. M. Scatd. clouds afterwards.
2	..	0.26	S. & E.	Cloudy; also drizzling between 2 and 3 A. M. & also at 7 & 9 P. M.
3	*Sunday.*			
4	120.0	..	S. &. S. W.	Cloudless till 3 A. M. Scatd. clouds till 8 P. M. cloudless afterwards.
5	118.0	..	S. &. S. W.	Cloudless till 2 A. M. Scatd. ⌒i till 1 P. M. cloudy afterwards, also drizzling between 6 & 8 P. M.
6	125.0	..	S. &. S. E.	Scatd. \i & ⌣i till 8 A. M. Scatd. ⌒i afterwards.
7	127.4	0.12	S.	Cloudy till 4 A. M. Scatd. ⌣i afterwards; also raining at Midnight.
8	..	..	S. & calm.	Cloudy.
9	122.0	..	S.	Cloudless till 3 A. M. Scatd. clouds afterwards; also slightly drizzling between 7 & 8 P. M.
10	*Sunday.*			
11	131.9	..	S. & S. W.	Clouds of various kinds till 7 P. M. cloudless afterwards.
12	122.5	..	S. & S. W.	Cloudless till 4 A. M. Scatd. clouds afterwards.
13	121.0	..	S.	Cloudless till 7 A. M. cloudy afterwards.
14	125.0	..	S.	Clondy; also very slightly drizzling at 5 A. M.
15	..	0.28	S.	Cloudy; also drizzling at 3 & 5 P. M.
16	127.0	..	S. & S. W.	Scatd. \i & ⌣i till 7 A. M. Scatd. ⌒i afterwards.
17	*Sunday.*			
18	134.0	..	N. E. & E.	Cloudy.
19	..	0.11	N. E. & E.	Clondy; also raining at Noon & 5 P. M.
20	..	1.40	E. & S. E. & S.	Cloudy; also constantly raining or drizzling.
21	..	0.35	E. & N. E. & S. E.	Cloudy; also constantly raining between 1 & 6 P. M.
22	..	1.05	S. E. & E.	Cloudy: also constantly raining, with two or three loud peals of thunder at 3 P. M.
23	..	0.48	E. & N. E. & S. E.	Cloudy; and constantly raining in the afternoon.
24	*Sunday.*			
25	..	0.79	N. & S. E.	Cloudy; also raining after intervals with much lightning between 8 & 11 P. M.

\i Cirri, ⌣i cirro strati, ⌒i cumuli, ⌢i cumulo strati, ⌄i nimbi, —i strati, \⌒i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
26	..	4.04	N. & N. E.	Cloudy; high wind & constant rain from 10 A. M. till Midnight.
27	..		N. E. & S. & E.	Cloudy; also constantly raining between Midnight & 1 P. M.
28	..	0.21	S. & E.	Cloudy; also occasionally raining.
29	128.4	..	S. & S. E.	Scatd. ○i & ⌣i till 7 P. M. cloudless afterwards.
30	116.5	..	W. & calm.	Cloudless till 4 A. M. Scatd. ⌣i till 2 P. M. cloudy afterwards.
31	*Sunday.*			

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ..	29.530
Max. height of the Barometer, occurred at 10 A. M. on the 12th, ..	29.762
Min. height of the Barometer, occurred at 4 A. M. on the 27th, ..	28.721
Extreme Range of the Barometer during the month, ...	1.041
Mean of the Daily Max. Pressures, ...	29.597
Ditto ditto Min. ditto, ...	29.452
Mean daily range of the Barometer during the month, ...	0.145

	°
Mean Dry Bulb Thermometer for the month, ...	85.4
Max. Temperature occurred at 3 P. M. on the 18th, ...	94.8
Min. Temperature occurred at 9 P. M. on the 26th, ..	77.8
Extreme range of the Temperature during the month, ...	17.0
Mean of the daily Max. Temperatures, ...	91.2
Ditto ditto Min. ditto.	81.4
Mean daily range of the Temperatures during the month, ..	9.8

	°
Mean Wet Bulb Thermometer for the month, ...	81.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	4.0
Computed Mean Dew Point for the month, ...	79.4
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	6.0
	Inches.
Mean Elastic force of vapour for the month, ...	0.983

	Troy grains.
Mean weight of vapour for the month, ...	10.49
Additional weight of vapour required for complete saturation, ..	2.19
Mean degree of humidity for the month, complete saturation being unity,	0.83

	Inches.
Rained 15 days.—Max. fall of rain during 24 hours, ...	4.04
Total amount of rain during the month, ...	9.09
Prevailing direction of the Wind, ...	S. & S. E.

On the 26th July, a high Northerly wind sprung up about 10 A. M. and continued to blow till 5 P. M.; after which, a North Easterly wind set in, and blew for about 3 hours. About 8 P. M. the wind veered and became Easterly, which rose to a gale; the directions of which during several hours of its continuance, were as follows:

From 8 P. M. till Midnight, ... Easterly.
From Midnight till 1 A. M. on the 27th July,..... Northerly.
From 1 A. M. till 8 A. M. .... North Easterly.

At 8 A. M. the gale ceased.

During the prevalence of the gale there was incessant rain, but no thunder and lightning.

The Ten Minutes' observations taken during the gale, show that at 8 P. M. which was the commencement of the gale; the Barometer stood at 29.069 inches, it then continuously descended till it became 28.719 inches at 3. h. 40 m. A. M. After which, the Barometer began to ascend attaining to the height of 28.870 inches at 7 A. M. The Ten Minutes' observations were given up at this hour; but the Barometer was observed to rise continuously (without indicating the usual tides) till the Midnight of the 28th at which time, the height it stood at, was 29.458 inches.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1859.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	3	2	2	1	3	1	1		12		1						2		2
1	1		3	1	5	1	2		11		1						2		1
2	1		3	1	5	1	2	1	12	1	2								1
3	1		1	1	7	1	2	1	13	1	1								1
4	1		3	1	3	1	2		14										3
5	1		3	1	2		4	1	15	1	1								
6	2	1	4	1	2		2	1	14		2								
7	1		3	1	2		4		13		2				1				
8	1		3	1	3		2		13		2				1		1		
9	2		2		5	2			14		2		1						
10	2		2		4	1	1	1	14	1	3								
11	2		3		3	2	2		11		3		2						
Noon.	2		2	1	2		4	1	10	1	5		1						
1	2	1	2		1		6	2	9		4		2						
2	2	1	2				5	1	11		3		2				1		
3	2	1	3				6	2	9	1	3		2				1		
4	2	2	2		1		6	1	9	1	2		2				1		1
5	1		2	1	2	2	6	1	9		3	1	1				2		
6	1		2		1		6	1	11	1	2		2	1			1		
7	1		3	1	2	1	3		14		1		1	1			1		
8	1	1	1		4	1	3		13	3	2						2		
9	1		1	1	4	2	4		10		2						3		1
10	1		2	1	4		4		13		1						1		
11	1		2	1	5		3		14	1							1		

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.558	29.631	29.491	0.140	81.1	87.4	77.0	10.4
2	.644	.701	.580	.121	82.3	87.6	77.8	9.8
3	.670	.718	.629	.089	82.8	86.2	79.8	6.4
4	.664	.726	.612	.114	80.9	83.4	79.3	4.1
5	.701	.757	.652	.105	81.9	84.6	79.8	4.8
6	.702	.751	.643	.108	83.3	88.8	79.9	8.9
7	*Sunday.*							
8	.807	.860	.727	.133	80.6	86.6	76.2	10.4
9	.748	.810	.676	.134	82.3	90.0	78.4	11.6
10	.731	.780	.655	.125	83.3	88.5	79.6	8.9
11	.668	.717	.592	.125	82.4	87.6	79.9	7.7
12	.673	.739	.611	.128	81.2	86.1	79.0	7.1
13	.720	.777	.660	.117	82.2	87.8	78.4	9.4
14	*Sunday.*							
15	.699	.761	.629	.132	84.7	89.6	80.3	9.3
16	.645	.698	.560	.138	85.0	90.6	81.6	9.0
17	.613	.667	.531	.136	83.3	88.0	79.4	8.6
18	.617	.694	.560	.134	83.0	86.6	80.0	6.6
19	.683	.749	.628	.121	84.1	89.6	80.0	9.6
20	.729	.780	.671	.109	82.3	86.4	81.0	5.4
21	*Sunday.*							
22	.662	.703	.607	.096	82.7	90.0	80.2	9.8
23	.634	.701	.563	.138	83.3	88.8	80.4	8.4
24	.639	.701	.572	.129	82.8	86.8	79.8	7.0
25	.627	.684	.560	.124	83.5	88.2	80.0	8.2
26	.598	.641	.541	.100	81.7	85.3	79.6	5.7
27	.596	.634	.538	.096	80.0	82.2	78.0	4.2
28	*Sunday.*							
29	.504	.553	.434	.119	81.5	85.8	78.6	7.2
30	.537	.600	.491	.109	83.2	87.8	78.6	9.2
31	.536	.600	.462	.138	85.1	89.6	81.3	8.3

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	78.7	2.4	77.5	3.6	0.925	9.96	1.21	0.89
2	79.3	3.0	77.8	4.5	.934	10.03	.55	.87
3	79.6	3.2	78.0	4.8	.940	.09	.66	.86
4	78.6	2.3	77.4	3.5	.922	9.93	.17	.90
5	78.6	3.3	76.9	5.0	.908	.76	.68	.85
6	79.5	3.8	77.6	5.7	.928	.95	.98	.83
7	*Sunday.*							
8	78.4	2.2	77.3	3.3	.919	.92	.09	.90
9	78.9	3.4	77.2	5.1	.916	.85	.73	.85
10	79.9	3.4	78.2	5.1	.946	10.15	.78	.85
11	80.1	2.3	78.9	3.5	.967	.39	.22	.90
12	79.2	2.0	78 2	3.0	.946	.19	.02	.91
13	79.3	2.9	77.8	4.4	.934	.05	.49	.87
14	*Sunday.*							
15	80.8	3.9	78.8	5.9	.964	.31	2.11	.83
16	81.0	4.0	79.0	6.0	.970	.37	.16	.83
17	80.0	3.3	78.3	5.0	.949	.18	1.75	.85
18	80.2	2.8	78.8	4.2	.964	.36	.46	.88
19	80.5	3.6	78.7	5.4	.961	.31	.90	.84
20	80.2	2.1	79.1	3.2	.973	.47	.11	.90
21	*Sunday.*							
22	80.4	2.3	79.2	3.5	.976	.48	.24	.89
23	80.7	2.6	79.4	3.9	.983	.54	.39	.88
24	80.2	2.6	78.9	3.9	.967	.39	.36	.88
25	80.4	3.1	78.8	4.7	.964	.34	.66	.86
26	79.7	2.0	78.7	3.0	.961	.35	.02	.91
27	78.4	1.6	77.6	2.4	.928	.03	0.78	.93
28	*Sunday.*							
29	79.1	2.4	77.9	3.6	.937	.08	1.23	.89
30	79.8	3.4	78.1	5.1	.943	.12	.77	.85
31	81.2	3.9	79.2	5.9	.976	.43	2.14	.83

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Midnight.	29.670	29.819	29.523	0.296	80.8	82.6	76.2	6.4
1	.657	.809	.514	.295	80.6	82.5	76.6	5.9
2	.647	.792	.509	.283	80.3	82.4	76.6	5.8
3	.628	.741	.500	.241	80.2	82.2	78.2	4.0
4	.628	.796	.491	.305	79.8	81.8	77.0	4.8
5	.642	.802	.493	.309	79.7	81.6	77.0	4.6
6	.660	.815	.511	.304	79.6	81.6	77.2	4.4
7	·674	.838	.522	.316	80.3	82.4	77.6	4.8
8	·692	.854	.530	.324	81.7	84.2	78.8	5.4
9	.700	.853	.539	.314	83.2	86.2	79.8	6.4
10	.700	.860	.541	.319	84.5	87.6	79.8	7.8
11	.689	.848	.522	.326	85.6	88.0	80.0	8.0
Noon.	.674	.828	.517	.311	85.9	90.0	80.0	10.0
1	.654	.799	.498	.301	85.7	89.6	80.4	9.2
2	.629	.777	.469	.308	85.5	89.8	81.3	8.5
3	.608	.740	.444	.296	85.6	90.6	81.2	9.4
4	.587	.679	.434	.245	85.4	89.6	80.9	8.7
5	.593	.727	.441	.286	84.7	88.6	81.5	7.1
6	.604	.737	·457	.280	83.5	87.2	80.0	7.2
7	.622	.785	.470	.315	82.8	86.0	79.6	6.4
8	.647	.804	.509	.295	82.1	85.4	79.2	6.2
9	.666	.823	.530	.293	81.9	85.2	78.6	6.6
10	.682	.834	.536	.298	81.6	84.8	79.2	5.6
11	.681	.804	.528	.276	81.3	84.0	79.2	4.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	79.1	1.7	78.2	2.6	0.946	10.19	0.88	0.92
1	78.9	1.7	78.0	2.6	.940	.13	.88	.92
2	78.8	1.5	78.0	2.3	.940	.15	.76	.93
3	78.6	1.6	77.8	2.4	.934	.09	.79	.93
4	78.2	1.6	77.4	2.4	.922	9.97	.78	.93
5	78.2	1.5	77.4	2.3	.922	.97	.75	.93
6	78.0	1.6	77.2	2.4	.916	.91	.78	.93
7	78.5	1.8	77.6	2.7	.928	10.01	.90	.92
8	79.2	2.5	77.9	3.8	.937	.08	1.29	.89
9	80.0	3.2	78.4	4.8	.952	.21	.68	.86
10	80.5	4.0	78.5	6.0	.955	.23	2.12	.83
11	81.1	4.5	78.8	6.8	.964	.29	.47	.81
Noon.	81.2	4.7	78.8	7.1	.964	.29	.58	.80
1	81.0	4.7	78.6	7.1	.958	.23	.57	.80
2	80.8	4.7	78.4	7.1	.952	.17	.55	.80
3	81.1	4.5	78.8	6.8	.964	.29	.47	.81
4	80.9	4.5	78.6	6.8	.958	.23	.45	.81
5	80.8	3.9	78.8	5.9	.964	.31	.11	.83
6	80.3	3.2	78.7	4.8	.961	.31	1.69	.86
7	80.0	2.8	78.6	4.2	.958	.30	.45	.88
8	79.7	2.4	78.5	3.6	.955	.27	.24	.89
9	79.6	2.3	78.4	3.5	.952	.23	.21	.89
10	79.5	2.1	78.4	3.2	.952	.25	.09	.90
11	79.3	2.0	78.3	3.0	.949	.22	.02	.91

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches. *		
1	..	11.56 / 1.70	S. W. & S.	Cloudy; also constantly raining.
2	..	0.14	S. & S. W.	Cloudy; also constantly raining.
3	..	0.46	S. & S. E. & S .W.	Cloudy; also drizzling in the morning & raining between 9 & 11 P. M.
4	..	0.32	S.	Cloudy; also constantly drizzling.
5	..	..	S. & S. W.	Cloudy; also drizzling very slightly at 11 A. M.
6	119.6	..	S. W. & S.	Cloudy till 7 A. M. Scatd. ⌣i till 2 P. M. cloudy afterwards; also drizzling between 6 & 8 P. M.
7	*Sunday.*	0.74		
8	..	0.14	S.	Cloudy; also occasionally drizzling.
9	135.0	0.32	S. & S. W. & W.	Cloudy; also raining between 6 & 7 P. M.
10	..	..	S. W. & S.	Cloudy; also very slightly drizzling between 10 & 11 P. M.
11	..	0.70	W.	Cloudy with heavy rain at 1 & 3 P. M.; also slightly drizzling now and then.
12	..	0.38	S. W. & S.	Cloudy with occasional drizzling.
13	125.0	..	S. & S. E.	Cloudy with occasional drizzling.
14	*Sunday.*	0.12		
15	121.5	..	S.	Clouds of various kinds till 6 P. M. cloudless afterwards.
16	135.0	..	S. & S. W.	Scatd. clouds.
17	..	..	S. & S. E.	Cloudy; also very slightly drizzled between 9 & 10 P. M.
18	..	0.40	S.	Cloudy, with rain at Noon & 6 P. M.
19	125.4	..	S. & S. E. & N. E.	Scatd. clouds, with slight drizzling at 2 & 11 P. M.
20	..	1.57	S. & N. E. & S. E.	Cloudy, with drizzling between Midnight & 2 A. M. & also raining between 2 & 4 P. M.
21	*Sunday.*			
22	..	0.46	S. & S. E. & E.	Cloudy till 6 P. M. cloudless afterwards; also raining between Noon & 3 P. M.
23	..	..	S. E. & E.	Cloudy till 7 P. M. cloudless afterwards; also slightly drizzling at Noon & 2 P. M.

⌒i Cirri, ⌣i Cirro strati, ∩i Cumuli, ⌢i Cumulo strati, ⌣i Nimbi, —i Strati ⌒i Cirro cumuli.

* Fallen on the 31st July and 1st August till 8 A. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

Solar Radiation, Weather, &c.

Date.	Max Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
24	..	0.48	S. E.	Cloudy till 7 P. M. cloudless afterwards; also raining at Midnight & 7 A. M.
25	122.0	..	E. & N. E.	Cloudy, with slight drizzling at 1 & 3 A. M.
26	..	0.40	E. & S. E.	Cloudy; also drizzling after intervals in the afternoon.
27	..	0.36	E. & S.	Cloudy, with constant drizzling in the forenoon.
28	*Sunday.*	0.48		
29	..	0.12	E.	Scatd. _i till 5 A. M. cloudy afterwards with drizzling at 1 & 5 & 8 P. M.
30	122.5	0.37	S. & S. E.	Cloudy, with rain between 3 & 5 A. M. and slight drizzling at 7 P. M.
31	..	..	S. W. & S. & calm.	Scatd. clouds of various kinds.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

MONTHLY RESULTS.

	Inches
Mean height of the Barometer for the month, ...	29.652
Max. height of the Barometer occurred at 10 A. M. on the 8th, ..	29.860
Min. height of the Barometer occurred at 4 P. M. on the 29th, ..	29.434
Extreme range of the Barometer during the month, ...	0.426
Mean of the daily Max. Pressures, ...	29.709
Ditto ditto Min. ditto, ...	29.588
Mean daily range of the Barometers during the month, ...	0.121

	o
Mean Dry Bulb Thermometer for the month, ...	82.6
Max. Temperature occurred at 3 P. M. on the 16th, ...	90.6
Min. Temperature occurred at Midnight on the 8th, ...	76.2
Extreme range of the Temperature during the month, ...	14.4
Mean of the daily Max. Temperatures, ...	87.4
Ditto ditto Min. ditto, ...	79.4
Mean daily range of the Temperature during the month, ..	8.0

	o
Mean Wet Bulb Thermometer for the month, ...	79.7
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	2.9
Computed Mean Dew-point for the month, ...	78.2
Mean Dry Bulb Thermometer above computed Mean Dew-point, ..	4.4
	Inches
Mean Elastic force of Vapour for the month, ...	0.946

	Troy grains
Mean Weight of Vapour for the month, ...	10.17
Additional Weight of Vapour required for complete saturation, ..	1.51
Mean degree of humidity for the month, complete saturation being unity,	0.87

	Inches
Rained 27 days, Max. fall of rain during 24 hours, ...	11.56
Total amount of rain during the month, ...	21.22
Prevailing direction of the Wind, ...	S. & S. W

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August, 1859.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.					2	1	3	1	12	3	4	2	1	1			3		2
1					3	1	3		13	4	4	3	1				3	1	
2					3	1	4	1	12	2	4	1	1				2		1
3					4	2	6	1	11	1	2		1				1		2
4					4	1	6		13	2	2	1	1						1
5					4		6		13	1	3	1	1						
6					5		3		14	2	4	1	1						
7			2		7	1	4	2	9	1	6	1	1						
8			2		7		1		11		4	1	2						
9			2		5		2		10	1	7	1			1				
10	1		4		5		2		9	1	5		1						
11	1		4		3		3	1	9	2	7	1							
Noon.			4		3	1	3	2	10	2	6				1				
1			4	1	3	2	2	1	10	1	8								
2	1	1	2		2	1	3		12	2	7								
3			3	2	1		5		8	2	10	1							
4			2	1	3	1	3		7		9	1			1				2
5			1		4	1	4		10	2	7						1		
6					2		7		12	4	6	2							
7					2		5	2	13	2	4	1	1	1			2		
8					4	3	4		11	2	4	1	2				2		
9					4		5		11	2	3		2				2		
10	1	1			3		7		11	1	2		2				1		
11	1	1			2		7	1	12	3			3	1			1		1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.540	29.589	29.474	0.115	86.0	90.8	82.8	8.0
2	.611	.664	.561	.103	83.9	88.8	81.6	7.2
3	.598	.652	.526	.126	82.7	88.0	80.3	7.7
4	*Sunday.*							
5	.583	.643	.510	.133	83.5	87.6	80.0	7.6
6	.585	.634	.527	.107	84.9	90.2	80.6	9.6
7	.603	.655	.551	.104	85.4	90.6	81.8	8.8
8	.569	.628	.512	.116	85.0	89.8	82.0	7.8
9	.544	.598	.489	.109	83.6	90.4	80.1	10.3
10	.593	.666	.527	.139	83.8	90.0	80.4	9.6
11	*Sunday.*							
12	.702	.783	.653	.130	84.4	89.2	80.3	8.9
13	.693	.755	.625	.130	86.3	91.6	81.4	10.2
14	.656	.712	.589	.123	86.9	92.0	81.8	10.2
15	.658	.728	.597	.131	83.1	85.6	77.6	8.0
16	.669	.716	.621	.095	79.9	83.4	77.4	6.0
17	.682	.741	.620	.121	82.0	86.6	78.6	8.0
18	*Sunday.*							
19	.742	.799	.695	.104	82.0	87.2	80.0	7.2
20	.781	.843	.724	.119	79.2	82.1	76.0	6.1
21	.820	.874	.778	.096	81.0	84.4	79.0	5.4
22	.829	.896	.775	.121	82.4	87.0	78.0	9.0
23	.778	.845	.721	.124	83.3	88.0	79.4	8.6
24	.745	.799	.683	.116	85.0	90.0	78.6	11.4
25	*Sunday.*							
26	.852	.936	.796	.140	86.0	91.8	82.0	9.8
27	.840	.907	.768	.139	83.1	87.0	81.4	5.6
28	.819	.871	.753	.118	81.9	88.8	80.0	8.8
29	.838	.908	.786	.122	82.4	86.8	79.2	7.6
30	.864	.938	.800	.138	83.5	90.2	79.2	11.0

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	81.9	4.1	79.8	6.2	0.995	10.62	2.29	0.82
2	80.4	3.5	78.6	5.3	.958	.28	1.85	.85
3	80.4	2.3	79.2	3.5	.976	.48	.24	.89
4	*Sunday.*							
5	80.7	2.8	79.3	4.2	.979	.51	.49	.88
6	82.0	2.9	80.5	4.4	1.017	.89	.60	.87
7	82.2	3.2	80.6	4.8	.021	.90	.78	.86
8	82.3	2.7	80.9	4.1	.030	11.01	.52	.88
9	80.8	2.8	79.4	4.2	0.983	10.54	.49	.88
10	80.2	3.6	78.4	5.4	.952	.21	.89	.84
11	*Sunday.*							
12	81.1	3.3	79.4	5.0	.983	.51	.80	.85
13	81.9	4.4	79.7	6.6	.992	.57	2.45	.81
14	81.9	5.0	79.4	7.5	.983	.45	.80	.79
15	80.3	2.8	78.9	4.2	.967	.39	1.47	.88
16	77.6	2.3	76.4	3.5	.893	9.64	.14	.89
17	79.2	2.8	77.8	4.2	.934	10.05	.42	.88
18	*Sunday.*							
19	79.7	2.3	78.5	3.5	.955	.27	.20	.90
20	77.5	1.7	76.6	2.6	.899	9.71	0.85	.92
21	78.9	2.1	77.8	3.2	.934	10.07	1.07	.90
22	79.4	3.0	77.9	4.5	.937	.06	.55	.87
23	80.1	3.2	78.5	4.8	.955	.25	.68	.86
24	81.3	3.7	79.4	5.6	.983	.49	2.04	.84
25	*Sunday.*							
26	82.0	4.0	80.0	6.0	1.001	.68	.23	.83
27	80.0	3.1	78.4	4.7	0.952	.21	1.65	.86
28	79.1	2.8	77.7	4.2	.931	.02	.42	.88
29	79.3	3.1	77.7	4.7	.931	.00	.61	.86
30	79.6	3.9	77.6	5.9	.928	9.95	2.05	.83

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.705	29.869	29.546	0.323	81.8	85.4	78.4	7.0
1	.693	.853	.542	.311	81.5	85.2	78.6	6.6
2	.684	.845	.524	.321	81.3	85.0	78.4	6.6
3	.679	.851	.516	.335	81.1	84.8	78.0	6.8
4	.669	.850	.496	.354	80.8	84.6	77.5	7.1
5	.689	.848	.514	.334	80.6	83.0	76.0	7.0
6	.702	.856	.520	.336	80.4	83.0	76.5	6.5
7	.725	.883	.536	.347	81.2	83.8	76.2	7.6
8	.748	.908	.565	.343	83.0	85.6	76.7	8.9
9	.760	.938	.581	.357	84.2	87.2	77.0	10.2
10	.756	.936	.577	.359	85.4	88.6	77.5	11.1
11	.745	.922	.567	.355	86.1	90.6	78.2	12.4
Noon.	.722	.893	.547	.346	86.9	91.6	79.1	12.5
1	.699	.864	.511	.353	87.0	91.8	80.5	11.3
2	.676	.834	.507	.327	86.8	91.8	80.6	11.2
3	.654	.824	.482	.342	86.5	92.0	81.0	11.0
4	.646	.817	.474	.343	86.5	91.6	80.6	11.0
5	.646	.800	.477	.323	85.3	90.0	80.2	9.8
6	.662	.814	.506	.308	84.3	88.8	80.1	8.7
7	.677	.813	.535	.308	83.5	87.8	80.0	7.8
8	.698	.875	.560	.315	83.0	88.0	80.0	8.0
9	.715	.889	.562	.327	82.5	86.4	78.6	7.8
10	.725	.900	.579	.321	82.1	86.0	77.7	8.3
11	.714	.888	.554	.334	81.7	85.6	77.6	8.0

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	79.7	2.1	78.6	3.2	0.958	10.32	1.08	0.91
1	79.6	1.9	78.6	2.9	.958	.32	0.99	.91
2	79.6	1.7	78.7	2.6	.961	.35	.89	.92
3	79.3	1.8	78.4	2.7	.952	.25	.92	.92
4	79.0	1.8	78.1	2.7	.943	.16	.91	.92
5	79.1	1.5	78.3	2.3	.949	.24	.77	.93
6	79.0	1.4	78.3	2.1	.949	.24	.70	.94
7	79.5	1.7	78.6	2.6	.958	.32	.89	.92
8	80.4	2.6	79.1	3.9	.973	.45	1.37	.88
9	80.8	3.4	79.1	5.1	.973	.42	.82	.85
10	81.0	4.4	78.8	6.6	.964	.29	2.39	.81
11	81.3	4.8	78.9	7.2	.967	.32	.63	.80
Noon.	81.6	5.3	78.9	8.0	.967	.30	.95	.78
1	81.7	5.3	79.0	8.0	.970	.33	.96	.78
2	81.4	5.4	78.7	8.1	.961	.24	.97	.78
3	81.4	5.1	78.8	7.7	.964	.27	.83	.78
4	81.5	5.0	79.0	7.5	.970	.33	.77	.79
5	81.3	4.0	79.3	6.0	.979	.46	.18	.83
6	80.9	3.4	79.2	5.1	.976	.45	1.83	.85
7	80.6	2.9	79.1	4.4	.973	.45	.55	.87
8	80.5	2.5	79.2	3.8	.976	.48	.34	.89
9	80.1	2.4	78.9	3.6	.967	.39	.25	.89
10	79.8	2.3	78.6	3.5	.958	.30	.21	.90
11	79.5	2.2	78.4	3.3	.952	.25	.12	.90

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	126.0		Calm & N. E.	Cloudy.
2	119.0	0.11	N. E. & E. & S. E.	Cloudy, with slight drizzling at 11 A. M. and 2 P. M.
3	..	0.72	E.	Cloudy, with constant drizzling between 6 A. M. and 4 P. M.
4	*Sunday.*			
5	123.0	0.56	S. E. & E.	Cloudy with rain at 3 and 6 P. M.
6	124.8	..	S. E. & S.	Scatd. clouds.
7	127.0	1.11	S.	Cloudy, with rain at 8 A. M. and 7 P. M.
8	118.0	0.26	S. & S. E. & N. W.	Scatd. ⌒i till 8 A. M. cloudy afterwards, with rain between 10 and 11 A. M.
9	126.2	0.79	N. W. & W.	Cloudy, with constant rain between 2 and 8 P. M.
10	..	..	W. & S. W.	Cloudy and drizzling occasionally.
11	*Sunday.*	1.34		
12	..	..	S. & W.	Cloudy till 1 P. M. Scatd. ⌒i till 8 P. M. cloudless afterwards.
13	128.5	..	S. W. & S.	Cloudless till 8 A. M. Scatd. ∩i and ⌒i till 6 P. M. cloudless afterwards.
14	130.4	..	N. E. & S. W	Cloudless till 5 A. M. Scatd. ⌒i and ∩i afterwards.
15	..	0.76	S. W. & N. W.	Cloudy, with rain between 4 and 5 A. M. and also between 8 and 11 P. M.
16	..	1.16	S. W.	Cloudy, with rain between 4 and 5 A. M. and also at 9 A. M.
17	..	0.16	S.	Scatd. \i and ⌒i till 9 A. M. Scatd. ∩i afterwards ; also slightly raining between 11 A. M. and 1 P. M.
18	*Sunday.*			
19	135.2	1.26	S. & E.	Scatd. ⌒i till 8 A. M. cloudy afterwards ; also raining at 2 and 5 and 6 P. M.
20	..	1.96	S.	Cloudy, with rain from 8 A. M. till Noon.
21	..	0.14	S.	Cloudy, with slight drizzling at 7 and 10 A. M. and also at 6 P. M.
22	..	0.67	S.	Cloudy till 6 P. M. with rain from 3 A. M. to 7 A. M., cloudless after 6 P. M.
23	127.6	..	S. & S. W.	Cloudless till 8 A. M. Scatd. ⌒i and ∩i till 9 P. M. cloudless afterwards.
24	135.3	0.32	S. & S. W.	Cloudless till 5 A. M. Scatd. clouds afterwards with rain at 10 P. M.

\i Cirri, ⌒i cirro strati, ∩i cumuli, ⌢i cumulo strati, \⌒i nimbi, —i strati, \∩i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
25	*Sunday.*			
26	142.5	..	S.	Cloudless till 4 A. M. Scatd. _i and ⌒i till 6 P. M. cloudless afterwards; also slightly drizzled at Noon.
27	..	..	S.	Cloudy till 7 P. M. cloudless afterwards; also slightly drizzled between 10 and 11 A. M.
28	..	..	S. E. & S.	Cloudless till 6 A. M. Scatd. _i till 11 A. M. cloudy till 6 P. M., cloudless afterwards, with slight drizzling at 3 P. M.
29	127.0	0.23	S. & S. E. & E.	Cloudless till 7 A. M. Scatd. _i and ⌒i till 8 P. M. cloudless afterwards; also raining at Noon, 1 and 3 P. M.
30	138.0	..	N. E. & E.	Cloudless 6 A. M. Scatd. ⌒i till 6 P. M. cloudless afterwards; also slightly drizzled at 3 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.699
Max. height of the Barometer, occurred at 9 A. M. on the 30th, ..	29.938
Min. height of the Barometer, occurred at 4 P. M. on the 1st, ..	29.474
Extreme Range of the Barometer during the month, ...	0.464
Mean of the Daily Max. Pressures, ...	29.761
Ditto ditto Min. ditto, ...	29.641
Mean daily range of the Barometer during the month, ...	0.120

	o
Mean Dry Bulb Thermometer for the month, ...	83.5
Max. Temperature occurred at 3 P. M. on the 14th, ...	92.0
Min. Temperature occurred at 5 A. M. on the 20th, ..	76 0
Extreme range of the Temperature during the month, ...	16.0
Mean of the daily Max. Temperatures, ...	88.4
Ditto ditto Min. ditto, ...	80.0
Mean daily range of the Temperatures during the month, ..	8.4

	o
Mean Wet Bulb Thermometer for the month, ...	80.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	3.1
Computed Mean Dew Point for the month, ...	78.8
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	4.7
	Inches.
Mean Elastic force of vapour for the month, ...	0.964

	Troy grains.
Mean weight of vapour for the month, ...	10.34
Additional weight of vapour required for complete saturation, ..	1.66
Mean degree of humidity for the month, complete saturation being unity,	0.86

	Inches
Rained 21 days.—Max. fall of rain during 24 hours, ...	1.96
Total amount of rain during the month, ...	11 55
Prevailing direction of the Wind, ...	S. & S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September, 1859.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			1		4		2		13		2				2		2		
1			1		4		3		13		2				2		1		
2			1		4		3		13		2				2		1		
3			1		6		1		13	2	2				2		1		
4			1		4		1		9	2	4	1			2	1	1		4
5			1		5		1		11	2	5	2			2	1	1		
6			1		5	1	2		10	2	6				1		1		
7	1		3		3	1	2		8	3	7				1		1		
8	2		1		4		3	1	6	1	4		3		1				2
9	1		1		4		3		8	1	4		4	1					1
10			1		6		1		9	2	4		4		1				
11			2		3	1	3	1	10	1	3		5						
Noon.			4		2	1	4	1	7	2	4	1	4		1				
1			3		1		5	1	7		5	1	5						
2			4	1	1	1	5	1	7		5		4	1					
3			2	1	1		6	3	8		6		2		1				
4	1		3	1	1		3		9		7		1		1				
5			3		1		2		15	1	3		2	1					
6			3		1		2	1	15	2	3		2	2					
7	1	1	1		1		3		15	1	3		1	1			1		
8			1		1		3		15		4	2	1				1		
9			1				3	1	17		2				1		2		
10			1				3		17	2	2				2	1	1		
11	1		1		1		3		14	1	2				2		1		1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.837	29.899	29.767	0.132	83.7	89.8	80.2	9.6
2	*Sunday.*							
3	.702	.771	.641	.130	81.0	85.2	78.8	6.4
4	.682	.735	.628	.107	78.7	82.7	77.6	5.1
5	.698	.756	.639	.117	80.7	86.4	77.3	9.1
6	.677	.722	.600	.122	82.3	88.2	78.6	9.6
7	.688	.746	.639	.107	82.8	87.2	80.1	7.1
8	.697	.764	.626	.138	82.4	86.6	79.6	7.0
9	*Sunday.*							
10	.743	.790	.693	.097	81.0	86.0	78.2	7.8
11	.767	.825	.718	.107	81.8	86.6	77.8	8.8
12	.770	.835	.709	.126	83.0	87.4	79.4	8.0
13	.768	.829	.716	.113	82.5	87.2	78.8	8.4
14	.781	.850	.720	.130	83.3	87.6	79.6	8.0
15	.772	.817	.706	.111	83.1	87.4	79.8	7.6
16	*Sunday.*							
17	.739	.804	.685	.119	83.6	88.6	79.6	9.0
18	.716	.783	.651	.132	83.3	89.3	78.0	11.3
19	.682	.746	.625	.121	82.3	87.2	79.0	8.2
20	.696	.752	.652	.100	82.0	88.0	75.6	12.4
21	.777	.844	.723	.121	81.5	88.6	76.0	12.6
22	.845	.914	.801	.113	80.9	88.4	74.4	14.0
23	*Sunday.*							
24	.889	.958	.838	.120	79.9	87.0	76.0	11.0
25	.914	.981	.865	.116	80.8	87.8	75.2	12.6
26	.960	30.021	.915	.106	81.2	87.6	76.0	11.6
27	.979	.048	.927	.121	80.2	86.8	75.0	11.8
28	.980	.053	.931	.122	79.4	86.6	74.2	12.4
29	.968	.039	.926	.113	78.9	86.2	72.1	14.1
30	*Sunday.*							
31	.967	.027	.915	.112	78.0	87.2	71.8	15.4

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Offiee, Calcutta, in the month of October, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	79.8	3.9	77.8	5.9	0.934	10.01	2.06	0.83
2	*Sunday.*							
3	78.7	2.3	77.5	3.5	.925	9.96	1.18	.89
4	77.6	1.1	77.0	1.7	.910	.85	0 56	.95
5	78.6	2.1	77.5	3.2	.925	.98	1.06	.90
6	80.0	2.3	78.8	3.5	.964	10.36	.22	.90
7	80.3	2.5	79.0	3.8	.970	.42	.23	.89
8	79.8	2.6	78.5	3.9	.955	.27	.34	.89
9	*Sunday.*							
10	78.9	2.1	77.8	3.2	.934	.07	.07	.90
11	78.5	3.3	76.8	5.0	.905	9.73	.67	.85
12	79.2	3.8	77.3	5.7	.919	.86	.96	.83
13	78.6	3.9	76.6	5.9	.899	.65	.99	.83
14	79.9	3.4	78.2	5.1	.946	10.15	.78	.85
15	80.2	2.9	78.7	4.4	.961	.33	.53	.87
16	*Sunday.*							
17	79.2	4.4	77.0	6.6	.910	9.75	2.28	.81
18	78.3	5.0	75.8	7.5	.876	.39	.54	.79
19	78.1	4.2	76.0	6.3	.882	.48	.10	.82
20	76.9	5.1	74.3	7.7	.835	8.97	.50	.78
21	75.3	6.2	72.2	9.3	.781	.40	.91	.74
22	73.7	7.2	70.1	10.8	.729	7.85	3.25	.71
23	*Sunday.*							
24	74.2	5.7	71.3	8.6	.758	8.18	2.60	.76
25	74.8	6.0	71.8	9.0	.771	.30	.77	.75
26	75.0	6.2	71.9	9.3	.773	.33	.88	.74
27	74.3	5.9	71.3	8.9	.758	.18	.70	.75
28	73.1	6.3	69.9	9.5	.725	7.82	.80	.74
29	72.7	6.2	69.6	9.3	.717	.76	.71	.74
30	*Sunday.*							
31	71.3	6.7	67.9	10.1	.679	.36	.83	.72

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.799	29.988	29.681	0.307	79.0	81.8	74.6	7.2
1	.788	.965	.667	.298	78.7	81.6	74.0	7.6
2	.779	.963	.655	.308	78.4	81.6	73.8	7.8
3	.774	.962	.628	.334	78.0	81.0	73.2	7.8
4	.771	.960	.637	.323	77.8	81.0	72.3	8.7
5	.782	.970	.649	.321	77.8	80.7	71.8	8.9
6	.802	.992	.657	.335	77.3	80.2	71.8	8.4
7	.823	30.017	.687	.330	78.0	81.0	72.6	8.4
8	.849	.037	.703	.334	80.7	84.0	76.8	7.2
9	.856	.053	.722	.331	82.2	85.6	78.2	7.4
10	.854	.048	.716	.332	83.4	86.5	79.4	7.1
11	.836	.027	.693	.334	84.6	87.6	79.2	8.4
Noon.	.810	.002	.664	.338	85.6	88.6	76.8	11.8
1	.782	29.981	.633	.348	86.3	88.8	77.2	11.6
2	.758	.960	.611	.349	86.3	89.8	78.7	11.1
3	.747	.943	.607	.336	86.3	89.3	78.2	11.1
4	.742	.932	.600	.332	85.3	88.3	78.7	9.6
5	.754	.933	.630	.303	84.3	87.4	78.9	8.5
6	.764	.949	.639	.310	82.9	85.4	78.8	6.6
7	.784	.976	.652	.324	81.7	84.2	78.0	6.2
8	.803	.995	.678	.317	80.9	83.6	76.6	7.0
9	.816	30.007	.692	.315	80.2	82.8	75.8	7.0
10	.820	.007	.692	.315	79.7	82.5	75.0	7.5
11	.808	29.995	.691	.304	79.2	82.0	73.8	8.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	76.8	2.2	75.7	3.3	0.873	9.45	1.05	0.90
1	76.7	2.0	75.7	3.0	.873	.45	0.96	.91
2	76.4	2.0	75.4	3.0	.865	.37	.94	.91
3	76.0	2.0	75.0	3.0	.854	.25	.94	.91
4	75.9	1.9	74.9	2.9	.851	.22	.91	.91
5	76.0	1.8	75.1	2.7	.857	.28	.85	.92
6	75.4	1.9	74.4	2.9	.838	.10	.88	.91
7	75.9	2.1	74.8	3.2	.849	.20	.99	.90
8	77.0	3.7	75.1	5.6	.857	.23	1.81	.84
9	77.4	4.8	75.0	7.2	.854	.18	2.36	.80
10	77.6	5.8	74.7	8.7	.846	.06	.90	.76
11	77.9	6.7	74.5	10.1	.840	.00	3.39	.73
Noon.	78.1	7.5	74.3	11.3	.835	8.92	.84	.70
1	78.2	8.1	74.1	12.2	.830	.85	4.17	.68
2	78.2	8.1	74.1	12.2	.830	.85	.17	.68
3	78.3	8.0	74.3	12.0	.835	.90	.12	.68
4	77.5	7.8	73.6	11.7	.817	.72	3.92	.69
5	77.6	6.7	74.2	10.1	.832	.91	.37	.73
6	77.9	5.0	75.4	7.5	.865	9.28	2.51	.79
7	78 0	3.7	76.1	5.6	.885	.51	1.86	.84
8	77.8	3.1	76.2	4.7	.887	.56	.54	.86
9	77.5	2.7	76.1	4.1	.885	.55	.33	.88
10	77.1	2.6	75.8	3.9	.876	.46	.26	.88
11	76.9	2.3	75.7	3.5	.873	.43	.13	.89

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	139.6	0.16	S. & N. E. & E.	Cloudless till 7 A. M. Scatd. ⌒i till 2 P. M. cloudy till 6 P. M. cloudless afterwards; also drizzling at 3 & 4 P. M.
2	*Sunday.*			
3	..	0.80	S. E.	Scatd. _i till 8 A. M. cloudy afterwards; also drizzling at 9 A. M. & Noon & 5 & 7 P. M.
4	..	0.79	E. & S.	Cloudy the whole day with thunder & lightning at 11 P. M.; also rained incessantly between 4 A. M, & 3 P. M.
5	..	1.37	S. E. & S. & E.	Cloudy; also constantly raining between Midnight & 5 A. M.; also at 1 & 8 & 9 P. M.
6	..	..	S.	Scatd. \i & _i till 8 A. M. cloudy till 6 P. M. Scatd. i\ & _i afterwards; also slightly drizzled between 1 & 2 P. M.
7	141.7	..	S. & N.	Cloudy,; also drizzled at 6 A. M. & 3 P. M.
8	..	..	N. & N. E.	Cloudy the whole day with lightning at 4 A. M.; also drizzled at 10 P. M.
9	*Sunday.*	1.59		
10		0.25	S. E. & N. E.	Cloudy; also raining at 5 & 6 A. M.
11	129.3	..	N. & N. E.	Cloudless till 6 A. M. Scatd. _i & ⌒i till 9 P. M. cloudless afterwards.
12	136.0	..	N. & N. W.	Scatd. _i & ⌒i till 5 P. M. cloudless afterwards.
13	134.0	..	N. & N. W. & W.	Cloudless till 8 A. M. Scatd. clouds till 6 P. M. cloudless afterwards.
14	135.0	..	S. W. & W.	Scatd. clouds.
15	..	..	W.	Cloudless till 6 A. M. Scatd. clouds afterwards; also drizzled at 1 P. M.
16	*Sunday.*			
17	138.2	..	N. W. & N.	Cloudless till 8 A. M. Scatd. ⌒i till 5 P. M. cloudless afterwards.
18	140.0	..	W. & N.	Cloudless till 8 A. M. Scatd. _i & ⌒i till 6 P. M. cloudless afterwards.
19	135.2	..	N. & W. & N. W.	Cloudless till 6 A. M. Scatd. _i & ⌒i till 6 P. M. cloudless afterwards.
20	140.0	..	W.	Cloudless till 11 A. M. Scatd. ⌒i till 5 P. M. cloudless afterwards.

\i Cirri, _i Cirro strati, ⌒i Cumuli, ⌒i Cumulo strati, _i Nimbi, —i Strat i \i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
21	143.0	..	W.	Cloudless.
22	140.0	..	W. & S. W.	Cloudless.
23	*Sunday.*			
24	141.0	..	N. W. & W.	Scatd. ⌒i & ⌣i till 6 P. M. cloudless afterwards.
25	132.5	..	W. & E.	Scatd. clouds till 7 A. M. cloudless afterwards.
26	144.0	..	W. & N. & N. W	Scatd. ⌣i till 9 A. M. cloudless till 6 P. M. Scatd. ⌣i afterwards.
27	145.0	..	W. & N. W. & N.	Cloudless till 5 A. M. Scatd. ⌣i till 5 P. M. cloudless afterwards.
28	140.2	..	N. & N. W. & W.	Cloudless till 5 A. M. Scatd. ⌣i till 11 A. M. cloudless afterwards.
29	144.0	..	W. & N. W. & S.	Cloudless till 8 A. M. Scatd. ⌣i & ⌒i till 4 P. M. cloudless afterwards.
30	*Sunday.*			
31	142.2	..	W. & S. W.	Cloudless.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

MONTHLY RESULTS.

	Inches
Mean height of the Barometer for the month, ...	29.796
Max. height of the Barometer occurred at 9 A. M. on the 28th, ..	30.053
Min. height of the Barometer occurred at 4 P. M. on the 6th, ..	29.600
Extreme range of the Barometer during the month, ...	0.453
Mean of the daily Max. Pressures, ...	29.858
Ditto ditto Min. ditto, ...	29.741
Mean daily range of the Barometer during the month, ...	0.117

	o
Mean Dry Bulb Thermometer for the month, ...	81.5
Max. Temperature occurred at 2 P. M. on the 1st, ...	89.8
Min. Temperature occurred at 5 & 6 A. M. on the 31st, ...	71.8
Extreme range of the Temperature during the month, ...	18.0
Mean of the daily Max. Temperature, ...	87.2
Ditto ditto Min. ditto, ...	77.3
Mean daily range of the Temperature during the month, ..	9.9

	o
Mean Wet Bulb Thermometer for the month, ...	77.2
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	4.3
Computed Mean Dew-point for the month, ...	75.0
Mean Dry Bulb Thermometer above computed Mean Dew-point, ..	6.5
	Inches.
Mean Elastic force of Vapour for the month, ...	0.854

	Troy grains.
Mean Weight of Vapour for the month, ...	9.18
Additional Weight of Vapour required for complete saturation, ..	2.13
Mean degree of humidity for the month, complete saturation being unity,	0.81

	Inches.
Rained 10 days, Max. fall of rain during 24 hours, ...	1.59
Total amount of rain during the month, ...	4.96
Prevailing direction of the Wind, ...	W. & N. & N. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October, 1859.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	5		1		3	1	2		3		2		7		3				
1	5		1		3	1	2		3		2		7		3				
2	5		1		3	1	2		3		2		7		3				
3	3		1		4	1	2		2		2		7		3				2
4	4		1		4	2	2		2		2		6		4				1
5	4		1		3	1	2	1	3	1	2		6		3				2
6	4		1		3		2	1	3	1	3		3		7				
7	6				2	1	2		4		3		4		5				
8	8				1	1	2		4		1		7		2				1
9	8				1		3	1	3				9		2				
10	5				1		3		3	1			9		5				
11	6		1		1		2		4	1	1		9		2				
Noon.	7				1		2	1	4	1	2		8		2				
1	6				1		3	1	2	1	1		9		4	1			
2	8				1		3		2	2			8		4				
3	7				1	1	2		2	1	2		9	1	3				
4	6		1	1			1		3		1		7		5				2
5	3		2				3	1	1		2		8		6				1
6	4		2				3		2		1		9		4		1		
7	2		3		1		3	1	2		1		9		5				
8	2		3		2		1	1	3		1		9		5				
9	3		4		2		1	1	3		1		6		5		1		
10	3		4	1	2		1		3		1		6		5		1		
11	3		4		2		1		3		1		5		5				2

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.963	30.055	29.894	0.161	77.6	86.4	70.4	16.0
2	.898	29.970	.839	.131	77.5	85.6	69.2	16.4
3	.865	.938	.810	.128	76.3	84.8	69.2	15.6
4	.876	.939	.807	.132	77.7	86.6	70.4	16.2
5	.953	30.011	.904	.107	78.8	86.8	72.4	14.4
6	*Sunday.*							
7	.965	.042	.910	.132	76.1	84.8	68.6	16.2
8	.970	.033	.919	.114	76.5	84.2	69.6	14.6
9	.996	.070	.944	.126	76.0	82.8	70.2	12.6
10	.975	.044	.916	.128	76.5	84.2	70.6	13.6
11	.968	.038	.924	.114	76.7	83.6	72.0	11.6
12	30.000	.068	.947	.121	76.5	84.0	71.4	12.6
13	*Sunday.*							
14	29.993	.054	.919	.135	74.7	84.5	68.0	16.5
15	.993	.067	.938	.129	74.0	83.6	66.6	17.0
16	30.000	.074	.931	.143	74.3	83.8	66.8	17.0
17	29.982	.041	.925	.116	74.3	82.8	66.4	16.4
18	.957	.016	.909	.107	72.5	79.0	67.6	11.4
19	.925	29.999	.860	.139	73.7	82.2	68.6	13.6
20	*Sunday.*							
21	.940	30.017	.891	.126	72.1	81.6	64.8	16.8
22	.975	.045	.923	.122	71.3	80.6	63.0	17.6
23	.984	.076	.922	.154	71.5	81.0	64.5	16.5
24	.947	.042	.892	.150	72.7	81.6	66.8	14.8
25	.939	.019	.887	.132	71.8	80.6	64.8	15.8
26	.966	.033	.919	.114	71.6	81.1	64.8	16.3
27	*Sunday.*							
28	.972	.051	.908	.143	71.6	78.9	65.6	13.3
29	.931	.007	.869	.138	70.7	79.8	63.7	16.1
30	.908	29.979	.866	.113	69.9	80.0	62.3	17.7

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	71.6	6.0	68.6	9.0	0.695	7.53	2.54	0.75
2	71.2	6.3	68.0	9.5	.681	.38	.66	.74
3	70.4	5.9	67.4	8.9	.668	.26	.43	.75
4	72.4	5.3	69.7	8.0	.720	.80	.30	.77
5	73.3	5.5	70.5	8.3	.739	8.00	.44	.77
6	*Sunday.*							
7	70.4	5.7	67.5	8.6	.670	7.29	.34	.76
8	70.9	5.6	68.1	8.4	.684	.43	.32	.76
9	71.0	5.0	68.5	7.5	.692	.53	.07	.78
10	71.2	5.3	68.5	8.0	.692	.53	.22	.77
11	70.9	5.8	68.0	8.7	.681	.39	.41	.75
12	69.4	7.1	65.8	10.7	.634	6.89	.86	.71
13	*Sunday.*							
14	68.2	6.5	64.9	9.8	.615	.71	.52	.73
15	67.0	7.0	63.5	10.5	.588	.41	.63	.71
16	68.0	6.3	64.8	9.5	.613	.69	.43	.73
17	67.5	6.8	64.1	10.2	.599	.54	.58	.72
18	67.6	4.9	65.1	7.4	.619	.79	1.84	.79
19	67.8	5.9	64.8	8.9	.613	.71	2.25	.75
20	*Sunday.*							
21	65.5	6.6	62.2	9.9	.563	.16	.37	.72
22	64.9	6.4	61.7	9.6	.554	.07	.26	.73
23	66.4	5.1	63.8	7.7	.593	.50	1.88	.78
24	67.4	5.3	64.7	8.0	.611	.69	.99	.77
25	65.9	5.9	62.9	8.9	.576	.31	2.14	.75
26	64.8	6.8	61.4	10.2	.548	.02	.38	.72
27	*Sunday.*							
28	66.1	5.5	63.3	8.3	.584	.41	1.99	.76
29	65.4	5.3	62.7	8.0	.572	.29	.89	.77
30	63.6	6.3	60.4	9.5	.530	5.83	2.15	.73

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.957	30.032	29.857	0.175	70.6	74.8	65.7	9.1
1	.946	.018	.840	.178	70.2	74.8	65.5	9.3
2	.940	.005	.834	.171	69.8	74.0	65.0	9.0
3	.931	29.978	.825	.153	68.8	73.6	64.0	9.6
4	.929	.990	.807	.183	68.8	73.2	63.6	9.6
5	.947	30.009	.837	.172	68.2	72.6	63.0	9.6
6	.964	.018	.860	.158	67.7	72.4	62.5	9.9
7	.985	.038	.888	.150	67.9	72.8	62.3	10.5
8	30.013	.062	.918	.144	72.0	76.6	67.0	9.6
9	.027	.075	.936	.139	74.4	79.8	70.2	9.6
10	.024	.076	.933	.143	76.5	81.6	72.6	9.0
11	.001	.052	.911	.141	78.8	83.6	74.8	8.8
Noon.	29.972	.018	.882	.136	80.8	85.8	75.6	10.2
1	.942	29.989	.847	.142	82.1	86.8	77.8	9.0
2	.917	.966	.826	.140	82.8	86.8	78.2	8.6
3	.904	.947	.820	.127	82.4	86.6	77.4	9.2
4	.904	.956	.810	.146	80.5	84.8	76.6	8.2
5	.911	.975	.817	.158	78.8	83.4	74.0	9.4
6	.924	.968	.825	.143	76.6	81.0	71.4	9.6
7	.939	.986	.835	.151	75.1	78.8	70.0	8.8
8	.955	30.003	.839	.164	73.8	78.6	68.8	9.8
9	.968	.016	.850	.166	72.9	77.0	67.8	9.2
10	.968	.032	.858	.174	72.1	76.4	66.8	9.6
11	.957	.026	.857	.169	71.4	76.4	66.2	10.2

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	67.1	3.5	65.3	5.3	0.623	6.86	1.29	0.84
1	67.0	3.2	65.4	4.8	.626	.88	.17	.86
2	66.8	3.0	65.3	4.5	.623	.86	.09	.86
3	65.8	3.0	64.3	4.5	.603	.65	.06	.86
4	66.0	2.8	64.6	4.2	.609	.73	0.98	.87
5	65.5	2.7	63.9	4.3	.595	.58	1.00	.87
6	65.1	2.6	63.5	4.2	.588	.50	0.96	.87
7	65.3	2.6	63.7	4.2	.591	.54	.97	.87
8	67.6	4.4	65.4	6.6	.626	.85	1.65	.81
9	68.9	5.5	66.1	8.3	.640	.99	2.16	.76
10	69.4	7.1	65.8	10.7	.634	.89	.86	.71
11	70.0	8.8	65.6	13.2	.630	.82	3.62	.65
Noon.	70.8	10.0	65.8	15.0	.634	.83	4.24	.62
1	70.9	11.2	65.3	16.8	.623	.69	.82	.58
2	70.8	12.0	64.8	18.0	.613	.58	5.17	.56
3	70.7	11.7	64.8	17.6	.613	.58	.03	.57
4	69.9	10.6	64.6	15.9	.609	.56	4.42	.60
5	70.1	8.7	65.7	13.1	.632	.84	3.60	.66
6	70.3	6.3	67.1	9.5	.661	7.17	2.60	.73
7	69.8	5.3	67.1	8.0	.661	.20	.14	.77
8	69.2	4.6	66.9	6.9	.657	.18	1.80	.80
9	68.7	4.2	66.6	6.3	.651	.12	.61	.82
10	68.2	3.9	66.2	5.9	.642	.03	.50	.82
11	67.6	3.8	65.7	5.7	.632	6.94	.41	.83

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	137.0	..	S. W & N. W.	Cloudless.
2	143.0	..	N. W. & W. & N.	Cloudless.
3	142.0	..	S. W. & N. W.	Cloudless.
4	147.5	..	S. W. & S.	Cloudless.
5	141.8	..	N. & S.	Cloudless till 8 A. M. Scatd. ⌣i & ⌒i till 5 P. M. cloudless afterwards.
6	*Sunday.*			
7	141.2	..	N. E. & N. W.	Cloudless.
8	140.0	..	N. & S.	Cloudless till 10 A. M. Scatd. ⌣i & ⌒i till 3 P. M. cloudless afterwards.
9	132.0	..	N. W.	Cloudless till 7 A. M. Scatd. ⌣i & ⌒i afterwards.
10	140.0	..	S. W. & N. W. & N.	Scatd. ⌣i & ⌒i till 5 P. M. cloudless afterwards.
11	130.0	..	S. W. & N.	Scatd. ⌣i till 4 A. M. cloudy till 4 P. M. Scatd. \i afterwards.
12	142.0	..	N. W. & E. & S. W.	Cloudless till 3 A. M. Scatd. ⌣i & ⌒i till 7 P. M. cloudless afterwards.
13	*Sunday.*			
14	144.0	..	N. & N. W.	Cloudless.
15	141.0	..	N. & N. W.	Cloudless till 6 A. M. Scatd. ⌣i till 3 P. M. cloudless afterwards.
16	146.0	..	E. & N. & S. W.	Scatd. ⌣i & \i till 5 P. M. cloudless afterwards.
17	143.2	..	N. & E.	Cloudless.
18	..	..	N.	Scatd. clouds.
19	138.0	..	N.	Cloudy till 11 A. M. cloudless afterwards.
20	*Sunday.*			
21	138.8	..	N.	Cloudless.
22	138.0	..	N. & W.	Cloudless.
23	136.5	..	N. W. & E.	Cloudless till 3 A. M. Scatd. ⌣i till 8 P. M. cloudless afterwards.
24	139.0	..	N. & N. W.	Scatd. ⌣i till 1 P. M. cloudless afterwards.
25	137.0	..	N.	Cloudless.
26	139.0	..	N. & N. W.	Cloudless till 4 A. M. Scatd. ⌣i till 11 A. M. cloudless afterwards.
27	*Sunday.*			
28	137.0	..	N.	Cloudless till 6 A. M. Scatd. ⌣i till 7 P. M. cloudless afterwards.
29	135.7	..	N.	Cloudless till 5 A. M. Scatd. \i till 11 A. M. cloudless afterwards.
30	137.5	..	N.	Cloudless.

\i Cirri, ⌣i cirro strati, ⌒i cumuli, ⌒i cumulo strati, ⌣i nimbi, —i strati \i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Monthly Results.

	Inches
Mean height of the Barometer for the month, ...	29.955
Max. height of the Barometer, occurred at 10 A. M. on the 23rd, ..	30.076
Min. height of the Barometer, occurred at 4 A. M. on the 4th, ..	29.807
Extreme Range of the Barometer during the month, ...	0.269
Mean of the Daily Max. Pressures, ...	30.028
Ditto ditto Min. ditto, ...	29.899
Mean daily range of the Barometer during the month, ...	0.129

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	o
Mean Dry Bulb Thermometer for the month, ...	74.3
Max. Temperature occurred at 1 & 2 P. M. on the 5th, ...	86.8
Min. Temperature occurred at 7 A. M. on the 30th, ...	62.3
Extreme range of the Temperature during the month, ...	24.5
Mean of the daily Max. Temperatures, ...	82.9
Ditto ditto Min. ditto, ...	67.6
Mean daily range of the Temperature during the month, ..	15.3

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	o
Mean Wet Bulb Thermometer for the month, ...	68.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	5.9
Computed Mean Dew Point for the month, ...	65.4
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	8.9
	Inches
Mean Elastic force of vapour for the month, ...	0.626

	Troy grains.
Mean weight of vapour for the month, ...	6.82
Additional weight of vapour required for complete saturation, ..	2.30
Mean degree of humidity for the month, complete saturation being unity,	0.75

	Inches
Rained no days.—Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	N. & N. W. & S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1859.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	14		1								3		2		5				1
1	14		2						1		4		1		4				
2	13		2						1		4		1		4				1
3	13		1		1				1		3				4				3
4	13		1		1				1		4		1		4				1
5	13		1		1				1		4		1		4				1
6	14		2		2				1		3		1		3				
7	10		4		3				1		3		2		3				
8	12		3		2				2		1				5				1
9	13		5		2				2		1				3				
10	14		4		3						1		2		2				
11	10		5		2				1		2		4		2				
Noon.	13		1		3						3		4		2				
1	9		3		2				2		3				7				
2	9		3		1				1		3		2		7				
3	7		3		1				1		4				9				1
4	5		2		1				2		3		1		12				
5	10		1		1		1		2		2				9				
6	11				2		1		1		5				6				
7	10				2				1		5		1		6				1
8	11				2				1		5		1		6				
9	11				2				1		5		1		6				
10	11				2				1		6		1		5				
11	11				2						6		1		5				1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.894	29.973	29.821	0.152	71.5	80.0	64.0	16.0
2	.897	.961	.836	.125	72.8	80.6	66.6	14.0
3	.928	.992	.880	.112	71.9	79.3	66.6	12.7
4	*Sunday.*							
5	.942	30.018	.886	.132	72.7	79.4	67.5	11.9
6	.940	.013	.887	.126	74.2	79.2	70.8	8.4
7	.963	.029	.916	.113	75.0	81.9	69.9	12.0
8	.969	.047	.924	.123	74.9	81.2	69.0	12.2
9	.983	.051	.931	.120	73.5	77.4	70.6	6.8
10	30.019	.092	.975	.117	73.0	79.9	67.8	12.1
11	*Sunday.*							
12	.061	.138	30.002	.136	67.0	77.0	59.0	18.0
13	.040	.124	29.981	.143	66.7	76.4	59.2	17.2
14	.059	.134	30.011	.123	65.6	75.2	58.0	17.2
15	.092	.163	.050	.113	65.1	76.2	56.2	20.0
16	.106	.166	.065	.101	66.0	77.6	56.4	21.2
17	.111	.181	.058	.123	67.2	78.4	60.0	18.4
18	*Sunday.*							
19	.030	.118	29.964	.154	66.6	77.0	58.6	18.4
20	29.986	.080	.930	.150	68.8	79.6	60.4	19.2
21	30.003	.081	.946	.135	70.8	80.6	64.1	16.5
22	.071	.156	30.023	.133	66.0	75.6	58.6	17.0
23	.090	.170	.040	.130	65.2	75.5	56.5	19.0
24	.105	.195	.038	.157	66.8	76.2	59.0	17.2
25	*Sunday.*							
26	.045	.123	29.973	.150	67.2	75.4	60.5	14.9
27	.021	.099	.971	.128	66.5	76.8	58.6	18.2
28	.005	.081	.955	.126	66.0	77.0	57.6	19.4
29	29.977	.053	.915	.138	65.3	77.0	56.2	20.8
30	.980	.053	.933	.120	64.2	75.6	56.8	18.8
31	.969	.050	.916	.134	63.6	75.0	54.0	21.0

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	65.0	6.5	61.7	9.8	0.554	6.07	2.31	0.72
2	67.2	5.6	64.4	8.4	.605	.63	.08	.76
3	66.5	5.4	63.8	8.1	.593	.50	1.98	.77
4	*Sunday.*							
5	67.6	5.1	65.0	7.7	.617	.76	.92	.78
6	69.2	5.0	66.7	7.5	.653	7.11	.98	.78
7	70.0	5.0	67.5	7.5	.670	.30	2.01	.78
8	69.8	5.1	67.2	7.7	.664	.23	.05	.78
9	68.8	4.7	66.4	7.1	.646	.07	1.83	.79
10	66.2	6.8	62.8	10.2	.574	6.28	2.48	.72
11	*Sunday.*							
12	60.7	6.3	56.9	10.1	.472	5.21	.09	.71
13	61.4	5.3	58.2	8.5	.493	.45	1.78	.75
14	60.0	5.6	56.6	9.0	.467	.18	.82	.74
15	59.2	5.9	55.7	9.4	.453	.04	.85	.73
16	60.6	5.4	57.4	8.6	.480	.31	.77	.75
17	62.3	4.9	59.4	7.8	.513	.67	.68	.77
18	*Sunday.*							
19	61.5	5.1	58.4	8.2	.496	.49	.72	.76
20	64.6	4.2	62.5	6.3	.568	6.27	.44	.81
21	66.0	4.8	63.6	7.2	.590	.48	.72	.79
22	59.2	6.8	55.1	10.9	.444	4.93	2.15	.70
23	59.5	5.7	56.1	9.1	.459	5.11	1.80	.74
24	61.5	5.3	58.3	8.5	.494	.46	.80	.75
25	*Sunday.*							
26	63.0	4.2	60.5	6.7	.532	.89	.46	.80
27	61.9	4.6	59.1	7.4	.508	.63	.56	.78
28	61.0	5.0	58.0	8.0	.489	.42	.66	.77
29	59.7	5.6	56.3	9.0	.462	.14	.79	.74
30	58.9	5.3	55.2	9.0	.445	4.96	.73	.74
31	58.3	5.3	54.6	9.0	.437	.87	.70	.74

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.002	30.120	29.880	0.240	65.3	73.4	58.4	15.0
1	29.998	.108	.870	.238	64.5	73.0	57.4	15.6
2	.988	.087	.841	.246	64.0	72.8	57.0	15.8
3	.981	.078	.836	.242	63.3	72.6	56.6	16.0
4	.982	.080	.842	.238	62.6	72.6	56.0	16.6
5	.994	.103	.864	.239	62.4	72.2	55.2	17.0
6	30.012	.122	.878	.244	61.9	71.8	54.0	17.8
7	.033	.132	.892	.240	61.7	70.8	54.0	16.8
8	.065	.173	.914	.259	64.3	71.6	58.3	13.3
9	.082	.195	.930	.265	67.1	72.4	61.8	10.6
10	.083	.184	.936	.248	70.1	76.0	66.6	9.4
11	.066	.174	.925	.249	72.9	77.8	69.8	8.0
Noon.	.037	.140	.916	.224	75.5	79.8	72.4	7.4
1	.004	.108	.884	.224	77.1	81.9	74.2	7.7
2	29.978	.083	.843	.240	77.7	81.4	75.0	6.4
3	.964	.075	.835	.240	77.2	81.3	74.2	7.1
4	.959	.065	.824	.241	75.5	79.8	72.4	7.4
5	.965	.070	.821	.249	73.6	78.8	70.2	8.6
6	.979	.090	.854	.236	71.6	77.8	67.6	10.2
7	.994	.104	.857	.247	69.9	76.2	64.5	11.7
8	30.009	.119	.863	.256	68.8	75.8	63.3	12.5
9	.022	.126	.868	.258	67.7	75.0	61.8	13.2
10	.023	.140	.876	.264	66.9	74.7	60.6	14.1
11	.016	.129	.882	.247	66.1	74.4	59.2	15.2

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional weight of vapour required for complete saturation.	Mean degree of humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	62.2	3.1	60.3	5.0	0.528	5.87	1.06	0.85
1	61.6	2.9	59.9	4.6	.521	.79	0.97	.86
2	61.1	2.9	59.1	4.9	.508	.65	1.00	.85
3	60.4	2.9	58.4	4.9	.496	.52	0.99	.85
4	59.9	2.7	58.0	4.6	.489	.45	.92	.86
5	59.6	2.8	57.6	4.8	.483	.39	.94	.85
6	59.2	2.7	57.3	4.6	.478	.34	.89	.86
7	59.0	2.7	57.1	4.6	.475	.31	.88	.86
8	60.5	3.8	57.8	6.5	.486	.40	1.32	.80
9	62.1	5.0	59.1	8.0	.508	.62	.70	.77
10	63.5	6.6	60.2	9.9	.527	.79	2.24	.72
11	65.0	7.9	61.0	11.9	.541	.91	.82	.68
Noon.	66.3	9.2	61.7	13.8	.554	6.02	3.44	.64
1	67.0	10.1	61.9	15.2	.557	.04	.88	.61
2	67.5	10.2	62.4	15.3	.567	.14	.96	.61
3	67.2	10.0	62.2	15.0	.563	.10	.85	.61
4	66.3	9.2	61.7	13.8	.554	.02	.44	.64
5	66.0	7.6	62.2	11.4	.563	.15	2.78	.69
6	65.8	5.8	62.9	8.7	.576	.31	.09	.75
7	65.0	4.9	62.5	7.4	.568	.26	1.72	.78
8	64.4	4.4	62.2	6.6	.563	.20	.51	.80
9	63.6	4.1	61.1	6.6	.543	5.99	.47	.80
10	63.1	3.8	60.8	6.1	.537	.95	.33	.82
11	62.6	3.5	60.5	5.6	.532	.90	.20	.83

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	136.0	..	N.	Cloudy till 10 A. M. Scatd. ⌐i till 4 P. M. cloudy afterwards.
2	134.0	..	N.	Cloudless till 5 A. M. Scatd. clouds afterwards.
3	133.4	..	N. & N. W.	Cloudy till 6 A. M. Scatd. ⌐i till Noon cloudless till 4 P. M. cloudy afterwards.
4	*Sunday.*			
5	116.0	..	N. &. N. W.	Cloudy.
6	..	..	N. & N. W.	Cloudy.
7	135.4	..	N. W. & N. E.	Cloudy till 9 A. M. Scatd. \i and ⌐i till 4 P. M. cloudless afterwards.
8	138.0	..	N.	Cloudy.
9	..	..	N. E. & N.	Cloudy.
10	130.0	..	N. W. & N. & N. E.	Scatd. clouds till 4 P. M. cloudless afterwards.
11	*Sunday.*			
12	135.5	..	W. & N. W.	Cloudless.
13	134.0	..	W. & N. W.	Cloudless.
14	134.8	..	N. & W.	Cloudless.
15	135.0	..	N. & N. W.	Cloudless; also foggy morning and evening.
16	131.0	..	N. & N. W.	Cloudless.
17	133.0	..	N. & N. W.	Cloudless.
18	*Sunday.*			
19	132.0	..	N. &. N. W.	Cloudless.
20	138.2	..	N. & N. E.	Cloudless till 10 A. M. Scatd. \i and ⌐i till 6 P. M. cloudless afterwards.
21	135.5	..	N. W. & N.	Cloudless.
22	133.7	..	N.	Cloudless till 7 A. M. Scatd. ⌐i till 5 P. M. cloudless afterwards.
23	132.0	..	N. W. & N.	Cloudless nearly the whole day.
24	135.0	..	N. & N. W.	Cloudless till 11 A. M. \i about zenith till 3 P. M. Scatd. ⌐i till 9 P. M. cloudless afterwards.
25	*Sunday.*			
26	130.0	..	N. & N. W.	Cloudless till 6 A. M. Scatd. ⌐i till 4 P. M. cloudless afterwards.
27	130.0	..	N. & N. W.	Cloudless.
28	132.9	..	W. & N. W.	Cloudless.
29	135.4	..	N. & W.	Cloudless.
30	133.0	..	N. W. & W.	Cloudless.
31	132.2	..	N. W.	Cloudless.

\i Cirri, ⌐i cirro strati, ~i cumuli, ~i cumulo strati, ⌐ i nimbi, —i strati \i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

MONTHLY RESULTS.

	Inches
Mean height of the Barometer for the month, ...	30.010
Max. height of the Barometer, occurred at 9 A. M. on the 24th, ..	30.195
Min. height of the Barometer, occurred at 5 P. M. on the 1st, ..	29.821
Extreme Range of the Barometer during the month, ...	0.374
Mean of the Daily Max. Pressures, ...	30.087
Ditto ditto Min. ditto, ...	29.957
Mean daily range of the Barometer during the month, ...	0.130

	o
Mean Dry Bulb Thermometer for the month, ...	68.7
Max. Temperature occurred at 1 P. M. on the 7th, ...	81.9
Min. Temperature occurred at 6 & 7 A. M. on the 31st, ...	54.0
Extreme range of the Temperature during the month, ...	27.9
Mean of the daily Max. Temperatures, ...	77.8
Ditto ditto Min. ditto, ...	61.6
Mean daily range of the Temperature during the month, ..	16.2

	o
Mean Wet Bulb Thermometer for the month, ...	63.3
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	5.4
Computed Mean Dew Point for the month, ...	60.6
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	8.1
	Inches
Mean Elastic force of vapour for the month, ...	0.534

	Troy grains.
Mean weight of vapour for the month, ...	5.88
Additional weight of vapour required for complete saturation, ..	1.81
Mean degree of humidity for the month, complete saturation being unity,	0.77

	Inches
Rained 1 day.—Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	N. & N. W. & W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1859.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	14		1										2		9				1
1	13		1										3		10				
2	12		1										4		10				
3	12												4		9				2
4	12		1										5		7				2
5	12		1										5		8				1
6	14		1										4		8				
7	16	1											3		8				
8	14		4		1								4		4				
9	17		3	1	2								1		4				
10	16		5		1		1						1		3				
11	14		5		1		1								6				
Noon.	13		3		1		1						1		8				
1	13		1		1				1				3		8				
2	9		2								1		3		12				
3	9		2								1		3		12				
4	11		1										4		8				3
5	11												5		10				1
6	12		3										3		9				
7	13		3										3		8				
8	14		3										3		7				
9	15		3										3		6				
10	15		3										3		6				
11	15		3										2		6				1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	*Sunday.*							
2	29.932	30.005	29.878	0.127	64.8	75.4	56.4	19.0
3	.961	.042	.906	.136	66.0	76.4	59.0	17.4
4	.981	.052	.935	.117	64.2	75.4	55.0	20.4
5	30.002	.092	.942	.150	62.2	72.1	54.8	17.3
6	29.960	.036	.900	.136	61.8	72.8	53.2	19.6
7	.952	.024	.904	.120	64.4	77.8	54.4	23.4
8	*Sunday.*							
9	.994	.067	.947	.120	67.9	79.4	58.1	21.3
10	30.000	.082	.951	.131	65.9	75.4	57.4	18.0
11	29.999	.078	.949	.129	62.8	73.6	54.5	19.1
12	30.060	.130	.978	.152	62.4	74.0	52.7	21.3
13	.109	.203	30.048	.155	63.1	75.0	52.8	22.2
14	.081	.158	.015	.143	64.4	76.1	56.0	20.1
15	*Sunday.*							
16	.051	.153	29.993	.160	64.4	75.7	55.6	20.1
17	.068	.149	30.012	.137	64.0	74.9	56.0	18.9
18	29.996	.083	29.925	.158	64.6	76.4	54.9	21.5
19	.978	.039	.906	.133	68.5	81.4	57.5	23.9
20	30.040	.109	.989	.120	69.2	80.0	63.0	17.0
21	.039	.122	.971	.151	66.9	78.2	57.4	20.8
22	*Sunday.*							
23	.010	.086	.954	.132	69.3	82.2	58.4	23.8
24	29.982	.062	.917	.145	72.8	83.2	66.8	16.4
25	30.030	.102	.979	.123	71.3	80.6	65.2	15.4
26	.085	.163	30.027	.136	67.4	76.6	59.4	17.2
27	.047	.123	29.974	.149	66.1	77.0	57.6	19.4
28	.040	.123	.993	.130	67.1	79.2	57.2	22.0
29	*Sunday.*							
30	.039	.139	.979	.160	70.5	82.8	61.0	21.8
31	29.998	.081	.934	.147	72.1	84.4	62.8	21.6

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	*Sunday.*							
2	59.6	5.2	56.5	8.3	0.465	5.18	1.65	0.76
3	59.1	6.9	55.0	11.0	.442	4.91	2.17	.69
4	57.5	6.7	52.8	11.4	.411	.58	.11	.69
5	55.3	6.9	50.5	11.7	.380	.25	.04	.68
6	56.0	5.8	51.9	9.9	.398	.46	1.75	.72
7	58.0	6.4	53.5	10.9	.421	.68	2.06	.69
8	*Sunday.*							
9	61.5	6.4	57.7	10.2	.485	5.35	.16	.71
10	59.1	6.8	55.0	10.9	.442	4.91	.15	.70
11	56.3	6.5	51.7	11.1	.396	.42	1.99	.69
12	56.0	6.4	51.5	10.9	.393	.39	.94	.69
13	56.7	6.4	52.2	10.9	.402	.49	.98	.69
14	58.2	6.2	53.9	10.5	.426	.74	2.00	.70
15	*Sunday.*							
16	59.1	5.4	55.2	9.2	.445	.96	1.78	.74
17	58.6	5.4	54.8	9.2	.440	.89	.76	.74
18	58.9	5.7	55.5	9.1	.450	5.01	.77	.74
19	63.3	5.2	60.7	7.8	.536	.90	.75	.77
20	63.3	5.9	60.3	8.9	.528	.82	.99	.75
21	60.4	6.5	56.5	10.4	.465	.15	2.13	.71
22	*Sunday.*							
23	63.3	6.0	60.3	9.0	.528	.82	.01	.74
24	67.8	5.0	65.3	7.5	.623	6.82	1.89	.78
25	64.9	6.4	61.7	9.6	.554	.07	2.26	.73
26	60.4	7.0	56.2	11.2	.461	5.10	.29	.69
27	59.7	6.4	55.9	10.2	.456	.06	.04	.71
28	61.0	6.2	57.2	9.9	.476	.26	.06	.72
29	*Sunday.*							
30	64.7	5.8	61.8	8.7	.555	6.10	.03	.75
31	66.1	6.0	63.1	9.0	.580	.35	.18	.74

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.017	30.114	29.930	.184	61.7	68.4	57.2	11.2
1	.011	.115	.928	.187	61.0	67.8	56.4	11.4
2	.004	.108	.915	.193	60.2	67.2	55.6	11.6
3	29.998	.096	.911	.185	59.7	67.7	55.0	12.7
4	.993	.095	.902	.193	58.9	68.2	54.5	13.7
5	30.004	.109	.915	.194	58.6	67.7	53.7	14.0
6	.016	.125	.927	.198	57.9	67.0	52.8	14.2
7	.035	.141	.947	.194	57.7	67.4	52.7	14.7
8	.062	.151	.977	.174	60.4	68.4	55.9	12.5
9	.089	.203	30.004	.199	64.1	70.8	59.0	11.8
10	.096	.199	.005	.194	67.7	73.2	62.8	10.4
11	.078	.177	29.982	.195	71.1	77.4	66.2	11.2
Noon.	.048	.136	.959	.177	74.2	79.6	69.2	10.4
1	.013	.096	.924	.172	76.2	82.0	71.2	10.8
2	29.985	.071	.886	.185	77.3	83.8	72.1	11.7
3	.968	.056	.881	.175	77.4	84.4	71.8	12.6
4	.962	.048	.878	.170	75.3	82.6	69.4	13.2
5	.967	.053	.882	.171	73.3	80.2	68.0	12.2
6	.976	.064	.900	.164	70.4	78.6	64.8	13.8
7	.994	.093	.907	.186	68.0	74.8	62.7	12.1
8	30.010	.111	.930	.181	66.4	73.4	61.2	12.2
9	.023	.118	.941	.177	65.3	71.4	60.0	11.4
10	.027	.130	.949	.181	64.0	70.6	59.4	11.2
11	.019	.105	.947	.158	63.3	70.2	58.6	11.6

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	58.5	3.2	56.3	5.4	0.462	5.18	1.01	0.84
1	57.9	3.1	55.4	5.6	.449	.02	.04	.83
2	57.3	2.9	55.0	5.2	.442	4.97	0.94	.84
3	56.8	2.9	54.5	5.2	.435	.89	.93	.84
4	56.1	2.8	53.9	5.0	.426	.80	.87	.85
5	55.9	2.7	53.7	4.9	.423	.77	.85	.85
6	55.6	2.3	53.5	4.4	.421	.75	.74	.87
7	55.3	2.4	53.1	4.6	.415	.68	.78	.86
8	57.4	3.0	55.0	5.4	.442	.97	.98	.84
9	59.4	4.7	56.1	8.0	.459	5.12	1.55	.77
10	61.0	6.7	57.0	10.7	.473	.22	2.24	.70
11	62.3	8.8	57.9	13.2	.488	.35	.93	.65
Noon.	63.3	10.9	57.8	16.4	.486	.30	3.79	.58
1	64.3	11.9	58.3	17.9	.494	.36	4.30	.56
2	64.8	12.5	58.5	18.8	.498	.39	.59	.54
3	64.7	12.7	58.3	19.1	.494	.35	.66	.53
4	63.4	11.9	57.4	17.9	.480	.22	.18	.56
5	63.3	10.0	58.3	15.0	.494	.39	3.45	.61
6	62.9	7.5	59.1	11.3	.508	.58	2.52	.69
7	62.1	5.9	58.6	9.4	.499	.52	.01	.73
8	61.3	5.1	58.2	8.2	.493	.46	1.71	.76
9	60.6	4.7	57.8	7.5	.486	.39	.54	.78
10	60.0	4.0	57.2	6.8	.476	.29	.36	.80
11	59.5	3.8	56.8	6.5	.470	.24	.27	.81

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	*Sunday.*			
2	132.0	...	N. W. & N. & E.	Cloudless till 7 P. M. Scatd. _i afterwards.
3	134.0	..	N. & E.	Cloudless.
4	134.0	..	N. & N. W.	Cloudless.
5	130.5	..	N. & N. W.	Cloudless.
6	131.8	..	N. & W.	Cloudless.
7	135.0	..	N.	Cloudless.
8	*Sunday.*			
9	133.0	..	W.	Cloudless.
10	131.0	..	N. & N. W.	Cloudless.
11	134.0	..	N. W.	Cloudless.
12	133.0	..	N. W. &. N.	Cloudless.
13	132.4	..	N. & N. W.	Cloudless.
14	133.0	..	N. W.	Cloudless.
15	*Sunday.*			
16	130.0	..	N. & S. & W.	Cloudless.
17	124.0	..	N. & N. W. & W.	Cloudless.
18	134.6	..	W. & S. W.	Cloudless.
19	132.0	..	S. & S. W.	Cloudless.
20	136.0	..	N. & E. & S.	Cloudless ; also heavy fog between 5 & 9 A. M.
21	130.8	..	N. W. & N.	Cloudless.
22	*Sunday.*			
23	139.0	..	S. W. & S.	Cloudless.
24	137.6	..	S. W. & S.	Cloudless ; also foggy between 2 & 6 A. M.
25	134.6	..	N. & S.	Cloudless.
26	129.0	..	N. & N. E.	Cloudless.
27	130.0	..	N. W. & N.	Cloudless.
28	135.0	..	N. & N. W. & S. W.	Cloudless till 8 A. M. Scatd. \i & _i till 3 P. M. Cloudless afterwards.
29	*Sunday.*			
30	140.5	..	S.	Cloudless till 8 A. M. Scatd. \i till 2 P. M. Cloudless afterwards ; also foggy between 6 & 8 A. M.
31	139.6	..	S. & S. W.	Cloudless till 10 A. M. Scatd. \i till 6 P. M. Cloudless afterwards.

\i Cirri, _i Cirro strati, ^i Cumuli, ~i Cumulo strati, _i Nimbi, —i Strati, \i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	30.017
Max. height of the Barometer occurred at 9 A. M. on the 13th, ..	30.203
Min. height of the Barometer occurred at 4 P. M. on the 2d, ..	29.878
Extreme range of the Barometer during the month, ...	0.325
Mean of the daily Max. Pressures, ...	30.096
Ditto ditto Min. ditto, ...	29.958
Mean daily range of the Barometers during the month, ...	0.138

	o
Mean Dry Bulb Thermometer for the month, ...	66.3
Max. Temperature occurred at 3 P. M. on the 31st, ...	84.4
Min. Temperature occurred at 7 A. M. on the 12th, ...	52.7
Extreme range of the Temperature during the month, ...	31.7
Mean of the daily Max. Temperatures, ...	77.5
Ditto ditto Min. ditto, ...	57.6
Mean daily range of the Temperature during the month, ..	19.9

	o
Mean Wet Bulb Thermometer for the month, ...	60.2
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	6.1
Computed Mean Dew-point for the month, ...	56.5
Mean Dry Bulb Thermometer above computed Mean Dew-point, ..	9.8
	Inches.
Mean Elastic force of Vapour for the month, ...	0.465

	Troy grains.
Mean Weight of Vapour for the month, ...	5.15
Additional Weight of Vapour required for complete saturation, ..	2.00
Mean degree of humidity for the month, complete saturation being unity,	0.72

	Inches
Rained No days, Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	N. & N. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1860.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	8				2				4		4		1		7				
1	9				1				4		3		2		7				
2	9				1				4		3		2		7				
3	8				1				4		3		1		7				2
4	8				1				2		4		2		7				2
5	8		1		1				3		3		2		7				1
6	11		1						2		3		4		5				
7	12		2						1		3		4		4				
8	12		3		2				2		2		1		3				1
9	11		2		3				2		3		2		3				
10	11		2		4				2		2		2		3				
11	8		1		4		1		3		2		2		5				
Noon.	7				5		1		2		3		3		5				
1	7				2		1		2		4		3		7				
2	6				2		1		3		3		6		5				
3	7				1		1		2		3		5		7				
4	12						1		2		4				7				
5	9						1		3		3		2		8				
6	6		1		1				4		3		2		9				
7	7		1						5		3		2		8				
8	7		1						5		3		2		8				
9	7		1						5		3		2		8				
10	7		1						5		3		2		8				
11	6		1						5		3		2		8				1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.954	30.031	29.887	0.144	73.0	85.3	64.2	21.1
2	.955	.030	.887	.143	72.7	80.6	69.0	11.6
3	.977	.047	.918	.129	73.6	82.8	66.2	16.6
4	.985	.078	.915	.163	74.6	82.0	69.4	12.6
5	*Sunday.*							
6	.946	.023	.872	.151	76.9	85.6	71.8	13.8
7	.977	.052	.925	.127	75.8	84.0	70.6	13.4
8	.945	.035	.879	.156	73.1	83.4	65.0	18.4
9	.886	29.954	.822	.132	75.1	84.6	68.0	16.6
10	.898	.970	.820	.150	75.8	84.2	68.8	15.4
11	.905	.983	.834	.149	76.0	84.6	68.6	16.0
12	*Sunday.*							
13	.912	30.001	.832	.169	74.1	83.4	66.6	16.8
14	.893	29.973	.825	.148	74.8	85.7	65.2	20.5
15	.961	30.042	.905	.137	77.4	87.5	68.6	18.9
16	30.006	.086	.947	.139	78.3	88.2	69.6	18.6
17	.004	.095	.937	.158	78.9	88.2	70.8	17.4
18	29.912	29.994	.826	.168	78.6	88.6	69.2	19.4
19	*Sunday.*							
20	.922	30.001	.851	.150	76.9	84.7	72.2	12.5
21	.962	.054	.890	.164	75.1	86.0	65.0	21.0
22	.887	29.973	.808	.165	73.7	85.6	63.6	22.0
23	.877	.956	.826	.130	74.9	86.5	64.0	22.5
24	.866	.947	.803	.144	76.4	88.0	65.8	22.2
25	.856	.941	.788	.153	75.7	84.2	70.9	13.3
26	*Sunday.*							
27	.831	.919	.782	.137	74.8	86.2	63.9	22.3
28	.772	.844	.690	.154	79.8	93.4	69.0	24.4
29	.743	.815	.688	.127	78.2	87.6	71.0	16.6

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	66.0	7.0	62.5	10.5	0.568	6.21	2.55	0.71
2	67.5	5.2	64.9	7.8	.615	.74	1.94	.78
3	68.4	5.2	65.8	7.8	.634	.93	2.00	.78
4	71.0	3.6	69.2	5.4	.708	7.73	1.47	.84
5	*Sunday.*							
6	72.6	4.3	70.4	6.5	.736	.99	.87	.81
7	69.3	6.5	66.0	9.8	.638	6.94	2.60	.73
8	66.1	7.0	62.6	10.5	.570	.23	.56	.71
9	70.2	4.9	67.7	7.4	.674	7.36	1.98	.79
10	72.0	3.8	70.1	5.7	.729	.93	.61	.83
11	69.4	6·6	66.1	9.9	.640	6.96	2.64	.73
12	*Sunday.*							
13	66.8	7.3	63.1	11.0	.580	6.33	.74	.70
14	69.0	5.8	66.1	8.7	.640	.97	.29	.75
15	71.5	5.9	68.5	8.9	.692	7.51	.50	.75
16	72.0	6.3	68.8	9.5	.699	.56	.72	.74
17	71.6	7.3	67.9	11.0	.679	.34	3.13	.70
18	70.0	8.6	65.7	12.9	.632	6.84	.54	.66
19	*Sunday.*							
20	66.1	10.8	60.7	16.2	.536	5.81	4.05	.59
21	64.1	11.0	58.6	16.5	.499	.43	3.91	.58
22	63.6	10.1	58.5	15.2	.498	.43	.53	.61
23	65.6	9.3	60.9	14.0	.539	.87	.41	.63
24	66.8	9.6	62.0	14.4	.559	6.08	.64	.63
25	68.5	7.2	64.9	10.8	.615	.70	2.81	.71
26	*Sunday.*							
27	64.9	9.9	59.9	14.9	.521	5.67	3.59	.61
28	70.3	9.5	65.5	14.3	.628	6.78	.97	.63
29	66.6	11.6	60.8	17.4	.537	5.82	4.43	.57

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Midnight.	29.920	30.021	29.733	0.288	71.6	76.3	68.1	8.2
1	.913	.014	.716	.298	70.9	75.0	66.8	8.2
2	.902	.001	.714	.287	70.2	74.6	66.8	7.8
3	.889	29.997	.711	.286	69.9	74.0	65.6	8.4
4	.893	.989	.704	.285	69.5	73.6	64.8	8.8
5	.904	.999	.704	.295	68.8	72.6	64.9	7.7
6	.915	30.017	.717	.300	68.3	73.2	63.8	9.4
7	.934	.043	.735	.308	68.2	73.0	63.6	9.4
8	.962	.062	.782	.280	70.9	74.2	66.0	8.2
9	.985	.095	.805	.290	73.6	78.0	67.8	10.2
10	.993	.092	.815	.277	76.7	81.4	71.6	9.8
11	.979	.076	.803	.273	79.5	84.8	74.0	10.8
Noon.	.954	.047	.776	.271	82.0	88.0	75.2	12.8
1	.921	.020	.756	.264	83.9	90.4	77.4	13.0
2	.888	29.997	.726	.271	85.1	91.8	79.0	12.8
3	.863	.966	.706	.260	85.6	93.4	80.6	12.8
4	.852	.963	.692	.271	84.8	92.8	79.0	13.8
5	.852	.947	.688	.259	83.2	91.2	77.8	13.4
6	.860	.966	.690	.276	80.3	85.5	75.6	9.9
7	.878	.986	.704	.282	77.5	81.6	74.0	7.6
8	.902	30.013	.733	.280	75.7	79.8	72.2	7.6
9	.920	.032	.751	.281	74.5	79.3	71.6	7.7
10	.923	.026	.756	.270	73.5	78.2	69.8	8.4
11	.919	.027	.751	.276	72.9	77.5	69.6	7.9

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	67.3	4.3	65.1	6.5	0.619	6.79	1.61	0.81
1	66.9	4.0	64.9	6.0	.615	.77	.46	.82
2	66.5	3.7	64.6	5.6	.609	.70	.35	.83
3	66.4	3.5	64.6	5 3	.609	.71	.27	.84
4	66.3	3.2	64.7	4.8	.611	.73	.15	.85
5	65.5	3.3	63.8	5.0	.593	.54	.17	.85
6	65.4	2.9	63.7	4.6	.591	.52	.08	.86
7	65.3	2.9	63.6	4.6	.590	.50	.08	.86
8	67.1	3.8	65.2	5.7	.621	.83	.40	.83
9	68.0	5.6	65.2	8.4	.621	.80	2.13	.76
10	69.0	7.7	65.1	11.6	.619	.72	3.08	.69
11	69.5	10.0	64.5	15.0	.607	.56	4.10	.62
Noon.	70.1	11.9	64.1	17.9	.599	.43	5.04	.56
1	70.7	13.2	64.1	19.8	.599	.40	.73	.53
2	71.2	13.9	64.2	20.9	.601	.41	6.16	.51
3	71.3	14.3	64.1	21.5	.599	.38	.38	.50
4	70.7	14.1	63.6	21.2	.590	.29	.17	.51
5	70.4	12.8	64.0	19.2	.597	.40	5.49	.54
6	70.3	10.0	65.3	15.0	.623	.72	4.19	.62
7	69.7	7.8	65.8	11.7	.634	.87	3.17	.68
8	69.0	6.7	65.6	10.1	.630	.86	2.65	.72
9	68.6	5.9	65.6	8.9	.630	.87	.31	.75
10	68.1	5.4	65.4	8.1	.626	.84	.06	.77
11	67.9	5.0	65.4	7.5	.626	.84	1.89	.78

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	140.0	...	S.W. & S.	Cloudless, also foggy between 6 & 7 A. M.
2	125.4	..	E.	Cloudless till 5 A. M. Cloudy till Noon. Scatd. _i afterwards.
3	137.5	0.09	S. & E.	Cloudy till 8 P. M. Cloudless afterwards; also little drizzling with lightning and thunder between 4 and 5 A. M.
4	..	..	S.	Cloudless till 4 A. M. Scatd. Clouds afterwards.
5	*Sunday.*			
6	136.0	..	S. & S. W.	Cloudy till 5 P. M. Cloudless afterwards.
7	136.0	..	S. & N.	Cloudless till 2 A. M. cloudy till 8 A. M. Scatd. \i till 8 P. M. cloudless afterwards; also slightly foggy at 7 A. M.
8	138.0	..	E. & S. W. & W.	Cloudless.
9	135.2	..	S. W. & S.	Cloudless till 7 A. M. Scatd. \i & ^i till 5 P. M. Cloudless afterwards; also foggy between 5 & 7 A. M.
10	..	..	S. E. & S.	Cloudless till 7 A. M. Scatd. ^i afterwards; also foggy between 6 & 7 A. M.
11	135.6	..	N. E. & N.	Cloudless till Noon. Scatd. \i till 6 P. M. Cloudless afterwards.
12	*Sunday.*			
13	136.2	..	N. E. & N. W.	Scatd. \i till 3 P. M. Cloudless afterwards.
14	140.5	..	S. & S W. & W.	Cloudless till 5 A. M. Cloudy till 10 A. M. Cloudless afterwards.
15	139.0	..	S. W. & S.	Cloudless.
16	142.0	..	S. W. & S. E.	Cloudless.
17	139.0	..	S. E. & S. W.	Cloudless.
18	140.0	..	S. & W. & N. W.	Cloudless.
19	*Sunday.*			
20	..	..	N. & N. W.	Cloudless till 4 A. M. Scatd. _i till 6 P. M. Cloudless afterwards.
21	138.8	..	N. &. N. E.	Cloudless.
22	140.0	..	W. & N. & N. W.	Cloudless.
23	132.0	..	N. W. & S.	Cloudless till 5 A. M. Cloudy till 10 A. M. Cloudless afterwards.

\i Cirri, _i Cirro strati, ^i Cumuli, ~i Cumulo strati, _i Nimbi, —i Strati, \ni Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
24	138.8	..	S. & N. W.	Cloudless.
25	120.8	..	E. & S. W.	Cloudy till 9 P. M. Cloudless afterwards; also drizzling at 1 A. M. & 10 P. M.
26	*Sunday.*	.		
27	138.8	..	S. & W. & S. W.	Cloudless.
28	141.0	..	S. & S. W.	Cloudless.
29	132.0	..	S. & S. W.	Cloudless.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

MONTHLY RESULTS.

	Inches
Mean height of the Barometer for the month, ...	29.913
Max. height of the Barometer occurred at 9 A. M. on the 17th, ..	30.095
Min. height of the Barometer occurred at 5 P. M. on the 29th, ..	29.688
Extreme range of the Barometer during the month, ...	0.407
Mean of the daily Max. Pressures, ...	29.994
Ditto ditto Min. ditto, ...	29.846
Mean daily range of the Barometer during the month, ...	0.148

	o
Mean Dry Bulb Thermometer for the month, ...	75.8
Max. Temperature occurred at 3 P. M. on the 28th, ...	93.4
Min. Temperature occurred at 7 A. M. on the 22nd, ...	63.6
Extreme range of the Temperature during the month, ...	29.8
Mean of the daily Max. Temperatures, ...	85.7
Ditto ditto Min. ditto, ...	67.9
Mean daily range of the Temperature during the month, ..	17.6

	o
Mean Wet Bulb Thermometer for the month, ...	68.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	7.4
Computed Mean Dew-point for the month, ...	64.7
Mean Dry Bulb Thermometer above computed Mean Dew-point, ..	11.1
	Inches
Mean Elastic force of Vapour for the month, ...	0.611

	Troy grains
Mean Weight of Vapour for the month, ...	6.65
Additional Weight of Vapour required for complete saturation, ..	2.89
Mean degree of humidity for the month, complete saturation being unity,	0.70

	Inches
Rained 2 days, Max. fall of rain during 24 hours, ...	0.09
Total amount of rain during the month, ...	0.09
Prevailing direction of the Wind, ...	S. & S. W.

Abstract of the Results of the Hourly Metcorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1860.

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.	1	1	1		2		2		13		4				2				
1	1	1	1		3		2		12		4	1			2				
2	1	1	1		2		2		12		4				2				1
3	2	1	1		2		2		10		4				2				2
4	2	1	1		2	1	3		11		2				2				2
5	2	1	1		2	1	3		10		3				3				1
6	1	2	1		3		2		9		4				4				
7	2	4			3		2		5		5				4				
8	2	5			4		1		5		3		1		3				1
9	4	5			4		4		1		3		3		1				
10	4	3			2		2		7		3		2		2				
11	4	2			1		1		3		5		6		3				
Noon.	4	2							2		9		4		4				
1	5	1							2		8		5		4				
2	5	2					2		1		6		5		4				
3	6	2			1		1		1		5		7		2				
4	4				2				2		8		5		4				
5	3	1			3		1		3		8		4		2				
6	3	2			3		1		5		5		3		3				
7	3	2			3		1		6		5		3		2				
8	1	2			3		1		9		5		2		2				
9	2	2			2		1		10		5		1		2				
10	2	2			2	1	1		10		5		1		2				
11	2	2			2		1		10		5		1		2				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Faht.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.772	29.841	29.706	0.135	76.9	88.9	64.8	24.1
2	.795	.875	.737	.138	76.5	87.4	65.8	21.6
3	.762	.840	.684	.156	77.0	89.0	65.4	23.6
4	*Sunday.*							
5	.822	.907	.774	.133	81.3	91.4	74.8	16.6
6	.841	.925	.774	.151	81.8	92.0	74.5	17.5
7	.770	.860	.681	.179	81.6	92.2	75.6	16.6
8	.744	.826	.692	.134	80.5	89.6	73.6	16.0
9	.770	.854	.708	.146	78.6	85.6	73.0	12.6
10	.785	.865	.732	.133	80.6	89.9	73.0	16.9
11	*Sunday.*							
12	.895	.971	.822	.149	82.1	92.2	75.2	17.0
13	.865	.943	.794	.149	81.7	93.0	74.2	18.8
14	.858	.927	.781	.146	82.4	93.6	75.2	18.4
15	.844	.914	.783	.131	85.0	97.2	75.4	21.8
16	.873	.961	.808	.153	84.6	95.6	76.2	19.4
17	.866	.942	.813	.129	83.1	93.6	75.3	18.3
18	*Sunday.*							
19	.856	.949	.791	.158	83.2	93.3	74.7	18.6
20	.864	.955	.787	.168	84.4	96.8	75.0	21.8
21	.819	.891	.700	.191	82.5	91.0	77.2	13.8
22	.826	.902	.766	.136	81.9	92.4	72.8	19.6
23	.858	.939	.796	.143	82.8	92.4	74.8	17.6
24	.888	.969	.828	.141	83.4	95.4	73.4	22.0
25	*Sunday.*							
26	.761	.840	.668	.172	86.5	97.6	78.7	18.9
27	.772	.857	.710	.147	86.4	97.0	79.4	17.6
28	.779	.872	.686	.186	86.7	98.4	78.8	19.6
29	'742	.817	.679	.138	84.7	93.5	78.2	15.3
30	.710	.786	.649	.137	85.8	95.2	79.5	15.7
31	.652	.742	.560	.182	88.4	100.4	80.6	19.8

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	64.2	12.7	57.8	19.1	0.486	5.27	4.59	0.53
2	65.1	11.4	59.4	17.1	.513	.56	.19	.57
3	65.7	11.3	60.0	17.0	.523	.67	.22	.57
4	*Sunday.*							
5	75.7	5.6	72.9	8.4	.797	8.59	2.65	.76
6	74.9	6.9	71.4	10.4	.761	.18	3.22	.72
7	74.7	6.9	71.2	10.4	.756	.13	.21	.72
8	73.7	6.8	70.3	10.2	.734	7.92	.06	.72
9	73.3	5.3	70.6	8.0	.741	8.02	2.36	.77
10	75.6	5.0	73.1	7.5	.803	.65	.36	.79
11	*Sunday.*							
12	73.6	8.5	69.3	12.8	.711	7.63	3.88	.66
13	74.1	7.6	70.3	11.4	.734	.90	.47	.70
14	76.6	5.8	73.7	8.7	.819	8.80	2.81	.76
15	77.0	8.0	73.0	12.0	.801	.55	3.98	.68
16	75.8	8.8	71.4	13.2	.761	.13	4.26	.66
17	72.2	10.9	66.7	16.4	.653	7.00	.86	.59
18	*Sunday.*							
19	72.5	10.7	67.1	16.1	.661	.09	.80	.60
20	72.7	11.7	66.8	17.6	.655	.00	5.31	.57
21	71.4	11.1	65.8	16.7	.634	6.80	4.84	.58
22	69.1	12.8	62.7	19.2	.527	.15	5.29	.54
23	72.3	10.5	67.0	15.8	.659	7.07	4.68	.60
24	74.2	9.2	69.6	13.8	.717	.68	.28	.64
25	*Sunday.*							
26	77.2	9.3	72.5	14.0	.787	8.39	.71	.64
27	77.3	9.1	72.7	13.7	.792	.44	.62	.65
28	77.3	9.4	72.6	14.1	.790	.42	.76	.64
29	78.7	6.0	75.7	9.0	.873	9.34	3.08	.75
30	79.8	6.0	76.8	9.0	.905	.65	.18	.75
31	77.2	11.2	71.6	16.8	.766	8.11	5.73	.59

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.815	29.907	29.688	0.219	77.8	82.1	70.6	11.5
1	.805	.901	.676	.225	77.3	81.6	70.6	11.0
2	.793	.891	.659	.232	76.8	80.8	68.6	12.2
3	.783	.884	.627	.257	76.3	81.0	67.4	13.6
4	.780	.867	.621	.246	75.9	81.0	66.2	14.8
5	.795	.894	.633	.261	75.6	80.6	65.2	15.4
6	.810	.913	.661	.252	75.0	80.8	64.8	16.0
7	.833	.929	.693	.236	74.9	81.0	64.8	16.2
8	.864	.958	.727	.231	78.1	83.6	70.6	13.0
9	.881	.971	.737	.234	81.2	86.8	73.6	13.2
10	.886	.969	.742	.227	84.3	89.4	78.8	10.6
11	.874	.961	.731	.230	87.1	93.5	80.2	13.3
Noon.	.851	.941	.705	.236	89.6	96.8	81.6	15.2
1	.821	.906	.665	.241	91.7	99.3	83.2	16.1
2	.786	.877	.619	.258	92.6	99.9	85.6	14.3
3	.759	.848	.602	.246	92.9	100.4	85.6	14.8
4	.742	.832	.576	.256	92.3	99.6	84.5	15.1
5	.740	.828	.560	.268	90.5	98.2	82.0	16.2
6	.744	.833	.561	.272	87.3	94.2	80.2	14.0
7	.766	.851	.597	.254	84.1	89.6	77.8	11.8
8	.790	.874	.615	.259	82.1	88.6	75.6	13.0
9	.808	.888	.640	.248	80.7	85.6	74.4	11.2
10	.820	.899	.660	.239	79.5	85.0	73.2	11.8
11	.815	.890	.659	.231	79.0	84.0	71.8	12.2

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew point.	Dry Bulb above Dew point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of Air.	Additional Weight of vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	Troy grs.	Troy grs.	
Mid-night.	73.5	4.3	71.3	6.5	0.758	8.21	1.92	0.81
1	73.2	4.1	71·1	6.2	.753	.18	.80	.82
2	72.9	3.9	70.9	5.9	.748	.13	.70	.83
3	72.7	3.6	70.9	5.4	.748	.15	.54	.84
4	72.5	3.4	70.8	5.1	.746	.12	.45	.85
5	72.4	3.2	70.8	4.8	.746	.12	.36	.86
6	72.0	3.0	70.5	4.5	.739	.05	.26	.87
7	71.9	3.0	70.4	4.5	.736	.02	.26	.86
8	73.5	4.6	71.2	6.9	.756	.18	2.04	.80
9	74.4	6.8	71.0	10.2	.751	.09	3.11	.72
10	74.6	9.7	69.7	14.6	.720	7.69	4.59	.63
11	74.6	12.5	68.3	18.8	.688	.31	6.02	.55
Noon.	74.6	15.0	67.1	22.5	.661	6.98	7.35	.49
1	74.6	17.1	66.0	25.7	.638	.72	8.51	.44
2	74.6	18.0	65.6	27.0	.630	.63	9.00	.42
3	74.4	18.5	65.1	27.8	.619	.51	.26	.41
4	74.2	18.1	65.1	27.2	.619	.52	8.98	.42
5	74.6	15.9	66 6	23.9	.651	.86	7.86	.47
6	74.8	12.5	68.5	18.8	.692	7.36	6.05	.55
7	74.7	9.4	70.0	14.1	.727	.78	4.43	.64
8	74.3	7.8	70.4	11.7	.736	.91	3.60	.69
9	74.0	6.7	70.6	10.1	.741	.99	.05	.72
10	73.7	5.8	70.8	8.7	.746	8.05	2.61	.76
11	73.7	5.3	71.0	8.0	.751	.12	.38	.77

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	137.2	..	W. & S.	Cloudless.
2	135.0	..	S. W. & W. & S.	Cloudless.
3	137.6	..	S. & S. W. &. W.	Cloudless.
4	*Sunday.*			
5	138.4	..	S. W. & S.	Cloudless till 2 A. M. Scatd. clouds till 11 A. M. cloudless till 6 P. M. Scatd. ⌣i afterwards.
6	139.0	..	S. W. & N. W. & S. E.	Cloudless.
7	141.0	..	S.	Scatd. clouds till 10 A. M. cloudless afterwards.
8	120.4	..	S.	Cloudless till 9 A. M. Scatd. clouds till 3 P. M. cloudless afterwards.
9	125.0	..	S.	Scatd. clouds.
10	134.2	..	S. & S. E.	Cloudless till 7 A. M. Scatd. ⌣i & ∩i till 4 P. M. cloudless afterwards.
11	*Sunday.*			
12	141.2	..	S. W. & W.	Cloudy till 7 A. M. cloudless afterwards.
13	143.0	..	S. & S. W.	Cloudless.
14	133.8	..	S. W. & S. E. & S.	Cloudy till 9 A. M. cloudless afterwards.
15	137.2	..	S. & N.	Cloudless.
16	138.0	..	S. W. & S.	Cloudless till 5 P. M. cloudy afterwards.
17	135.0	..	N. W. & S. & N.	Cloudless till 7 A. M. cloudy till 7 P. M. cloudless afterwards.
18	*Sunday.*			
19	135.0	..	E. & S. E.	Cloudless till 2 P. M. Scatd. \i till 8 P. M. cloudless afterwards.
20	140.0	..	S. W. & S.	Cloudless.
21	..	..	S. & N. W.	Cloudy ; also slightly drizzling at 8 P. M.
22	138.0	..	W. & N.	Cloudy till 8 A. M. cloudless afterwards.
23	135.4	..	W. & N. W. & S.	Cloudless till 11 A. M. Scatd. \i till 3 P. M. cloudless afterwards.
24	136.0	..	S. & S. W. & W.	Cloudless.
25	*Sunday.*			
26	139.8	..	S. & S. E.	Cloudless till 4 A. M. cloudy till 7 A. M. cloudless afterwards.
27	137.0	..	N. &. W.	Cloudless till 4 A. M. cloudy till 7 A. M. cloudless afterwards.
28	141.0	..	S.	Cloudless.
29	132.0	..	S.	Cloudless.
30	134.6	..	S.	Cloudless till 4 A. M. cloudy till 10 A. M. cloudless afterwards.
31	138.0	..	S. & W.	Cloudless.

\i Cirri, ⌣i cirro strati, ∩i cumuli, ∩i cumulo strati, ⌣i nimbi, —i strati, ⌣i cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Monthly Results.

	Inches
Mean height of the Barometer for the month, ...	29.807
Max. height of the Barometer, occurred at 9 A. M. on the 12th, ..	29.971
Min. height of the Barometer, occurred at 5 P. M. on the 31st, ..	29.560
Extreme Range of the Barometer during the month, ...	0.411
Mean of the Daily Max. Pressures, ...	29.888
Ditto ditto Min. ditto, ...	29.737
Mean daily range of the Barometer during the month, ...	0.151

	o
Mean Dry Bulb Thermometer for the month, ...	82.6
Max. Temperature occurred at 3 P. M. on the 31st, ...	100.4
Min. Temperature occurred at 6 & 7 A. M. on the 1st, ...	64.8
Extreme range of the Temperature during the month, ...	35.6
Mean of the daily Max. Temperature, ...	93.1
Ditto ditto Min. ditto, ...	74.6
Mean daily range of the Temperature during the month, ..	18.5

	o
Mean Wet Bulb Thermometer for the month, ...	73.8
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	8.8
Computed Mean Dew Point for the month, ...	69.4
Mean Dry Bulb Thermometer above computed Mean Dew Point, ..	13.2
	Inches
Mean Elastic force of vapour for the month, ...	0.713

	Troy grains
Mean weight of vapour for the month, ...	7.66
Additional weight of vapour required for complete saturation, ..	4.02
Mean degree of humidity for the month, complete saturation being unity,	0.66

	Inches
Rained 1 day.—Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	S. & S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1860.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.							1		20		5		1						
1							1		20		5		1						
2							2		17		6		1				1		
3							2		17		6		1				1		
4							2		16		5						1		3
5					1		2		15		8								1
6					1		2		13		8		2		1				
7					1		4		13		5		3		1				
8	2				1				15		4		4		1				
9	2		1				1		12		6		5						
10	2		1				1		6		8		9						
11	5		1		1				4		9		6		1				
Noon.	3				1		2		4		6		7		4				
1	4				1		2		3		6		7		3				1
2	1				1		1		5		6		8		5				
3	1				1				6		8		8		3				
4	2				1				8		4		8		3				1
5	3				1		2		8		4		7		2				
6	2				1		3		10		4		4		3				
7	1				1		4		10		3		5		3				
8					1		3		12		4		4		3	1			
9					1		3		15		3		3		2				
10	1				1		3		15		3		2		2				
11	1				1		3		15		2		2		2				1

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	*Sunday.*							
2	29.754	29.842	29.678	0.164	85.3	97.6	74.8	22.8
3	.782	.872	.721	.151	85.7	98.0	77.8	20.2
4	.784	.856	.709	.147	85.2	94.6	79.5	15.1
5	.768	.829	.681	.148	85.4	93.8	78.6	15.2
6	.781	.841	.722	.119	83.4	93.6	73.6	20.0
7	.810	.869	.752	.117	82.5	91.1	74.0	17.1
8	*Sunday.*							
9	.769	.846	.686	.160	84.1	92.0	78.8	13.2
10	.722	.773	.635	.138	82.1	88.0	76.8	11.2
11	.734	.783	.676	.107	82.2	91.0	74.6	16.4
12	.757	.833	.668	.165	84.9	94.6	76.4	18.2
13	.760	.840	.668	.172	84.4	96.1	74.8	21.3
14	.799	.866	.726	.140	83.3	92.0	75.2	16.8
15	*Sunday.*							
16	.795	.849	.717	.132	83.6	92.0	74.5	17.5
17	.798	.856	.715	.141	83.6	93.0	72.3	20.7
18	.847	.921	.770	.151	80.8	91.8	72 2	19.6
19	.826	.913	.742	.171	82.7	92.2	74.0	18.2
20	.790	.868	.690	.178	85.4	95.6	77.0	18.6
21	.747	.820	.664	.156	86.3	95.0	80.2	14.8
22	*Sunday.*							
23	.692	.732	.627	.105	85.7	94.6	79.0	15.6
24	.719	.767	.659	.108	86.5	94.0	80.3	13.7
25	.749	.826	.669	.157	86.6	94.0	81.7	12.3
26	.732	.793	.669	.124	87.5	95.2	81.8	13.4
27	.693	.760	.618	.142	87.9	96.5	81.4	15.1
28	.680	.746	.639	.107	88.6	98.2	81.6	16.6
29	*Sunday.*							
30	.678	.753	.608	.145	89.1	100.8	80.6	20.2

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	*Sunday.*							
2	74.9	10.4	69.7	15.6	0.720	7.68	4.96	0.61
3	78.0	7.7	74.1	11.6	.830	8.85	3.95	.69
4	78.4	6.8	75.0	10.2	.854	9.12	.49	.72
5	78.5	6.9	75.0	10.4	.854	.12	.56	.72
6	77.4	6.0	74.4	9.0	.838	8.99	2.97	.75
7	75.6	6.9	72.1	10.4	.778	.36	3.28	.72
8	*Sunday.*							
9	77.3	6.8	73.9	10.2	.824	.83	.38	.72
10	76.5	5.6	73.7	8.4	.819	.82	2.69	.77
11	75.7	6.5	72.4	9.8	.785	.43	3.11	.73
12	75.9	9.0	71.4	13.5	.761	.12	4.37	.65
13	77.1	7.3	73.4	11.0	.811	.67	3.64	.70
14	77.5	5.8	74.6	8.7	.843	9.03	2.90	.76
15	*Sunday.*							
16	78.3	5.3	75.6	8.0	.871	.33	.70	.78
17	77.4	6.2	74.3	9.3	.835	8.96	3.07	.75
18	75.1	5.7	72.2	8.6	.781	.40	2.67	.76
19	74.8	7.9	70.8	11.9	.746	.00	3.72	.68
20	77.5	7.9	73.5	11.9	.814	.69	.99	.69
21	80.4	5.9	77.4	8.9	.922	9.83	.19	.76
22	*Sunday.*							
23	79.6	6.1	76.5	9.2	.896	.57	.23	.75
24	80.9	5.6	78.1	8.4	.943	10.06	.04	.77
25	80.8	5.8	77.9	8.7	.937	9.98	.16	.76
26	81.7	5.8	78.8	8.7	.964	10.25	.24	.76
27	81.8	6.1	78.7	9.2	.961	.22	.42	.75
28	81.8	6.8	78.4	10.2	.952	.10	.82	.73
29	*Sunday.*							
30	81.3	7.8	77.4	11.7	.922	9.77	4.35	.69

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.766	29.881	29.657	0.224	80.0	84.8	72.8	12.0
1	.759	.837	.657	.180	79.8	84.2	72.4	11.8
2	.747	.812	.653	.159	74.9	83.6	72.2	11.4
3	.742	.809	.651	.158	78.9	82.8	72.2	10.6
4	.737	.823	.639	.184	78.5	82.2	72.4	9.8
5	.754	.831	.648	.183	78.4	82.0	72.2	9.8
6	.772	.843	.670	.173	78.4	82.2	72.2	10.0
7	.793	.868	.696	.172	79.2	83.2	74.2	9.0
8	.814	.912	.720	.192	82.3	86.6	76.6	10.0
9	.823	.911	.724	.187	85.2	89.8	79.8	10.0
10	.822	.915	.732	.183	87.8	93.2	82.6	10.6
11	.809	.897	.711	.186	90.2	96.6	84.6	12.0
Noon.	.791	.884	.700	.184	92.1	98.8	86.0	12.8
1	.765	.857	.675	.182	93.3	99.2	86.8	12.4
2	.737	.828	.651	.177	94.0	100.8	88.0	12.8
3	.709	.803	.630	.173	93.8	100.7	87.6	13.1
4	.691	.785	.608	.177	92.7	98.0	87.6	10.4
5	.689	.770	.614	.156	90.8	96.2	87.0	9.2
6	.701	.777	.618	.159	88.0	92.0	85.0	7.0
7	.721	.809	.632	.177	86.0	89.0	83.2	5.8
8	.746	.861	.650	.211	83.1	86.4	72.8	13.6
9	.765	.889	.654	.235	82.0	85.0	72.3	12.7
10	.775	.892	.680	.212	81.6	84.8	73.6	11.2
11	.778	.921	.675	.246	81.0	84.6	73.7	10.9

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	76.0	4.0	74.0	6.0	0.827	8.93	1.88	0.83
1	76.1	3.7	74 2	5.6	.832	.98	.77	.84
2	76.6	3.4	74.3	5.1	.835	9.03	.59	.85
3	75.8	3.1	74.2	4.7	.832	.00	.47	.86
4	75.8	2.7	74.4	4.1	.838	.08	.27	.88
5	75.9	2.5	74.6	3.8	.843	.13	.18	.89
6	75.9	2.5	74.6	3.8	.843	.13	.18	.89
7	76.4	2.8	75.0	4.2	.854	.24	.32	.88
8	78.0	4.3	75.8	6.5	.876	.41	2.17	.81
9	78.8	6.4	75.6	9.6	.871	.29	3.32	.74
10	79.6	8.2	75.5	12.3	.868	.23	4.37	.68
11	80.2	10.0	75.2	15.0	.860	.09	5.50	.62
Noon.	80.7	11.4	75.0	17.1	.854	8.99	6.42	.58
1	80.9	12.4	74.7	18 6	.846	.88	7.07	.56
2	80.9	13.1	74.3	19.7	.835	.76	.51	.54
3	80.5	13.3	73.8	20.0	.822	.62	.56	.53
4	80.7	12.0	74.7	18.0	.846	.90	6.78	.57
5	80.0	10.8	74.6	16.2	.843	.91	5.93	.60
6	79.3	8.7	74.9	13.1	.851	9.04	4.64	.66
7	79.1	6.9	75.6	10.4	.871	.29	3.62	.72
8	77.6	5.5	74.8	8.3	.849	.11	2.75	.77
9	77.1	4.9	74.6	7.4	.843	.07	.40	.79
10	77.1	4.5	74.8	6.8	.849	.13	.21	.81
11	76.8	4.2	74.7	6.3	.846	.12	.02	.82

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	*Sunday.*			
2	138.0	..	S. & S. W.	Cloudless.
3	139.2	..	S.	Cloudless.
4	137.0	..	S. & S. E.	Flying clouds till 6 A. M. cloudless afterwards.
5	129.0	..	S.	Cloudy till 8 A. M. cloudless till 4 P. M. cloudy afterwards.
6	128.0	0.90	S. & S. E.	Scatd. clouds till 7 A. M. Scatd. \i till 5 P. M. cloudy with thunder & lightning till 8 P. M.; also rain at 8 P. M. Scatd. _i afterwards.
7	132.0	..	S.	Scatd. _i till 7 A. M. cloudless till 3 P. M. Scatd. \i till 7 P. M. cloudless afterwards.
8	*Sunday.*			
9	121.7	..	S.	Scatd. _i till 7 A. M. Scatd. clouds afterwards.
10	..	..	E. & S. E.	Cloudy till 7 P. M. Scatd. _i afterwards.
11	131.0	..	E. & S. E.	Scatd. clouds till 4 P. M. cloudless afterwards.
12	140.4	.	N. E. & S E. & S. W.	Cloudless.
13	136.0	0.16	S. & S. W.	Cloudless till 10 A. M. Scatd. ∩i till 4 P. M. cloudy afterwards; also lightning & thundering & raining between 8 & 9 P. M.
14	125.5	..	S. E. & S.	Cloudless till 6 A. M. Scatd. clouds afterwards.
15	*Sunday.*	0.39		
16	134.0	..	S.	Cloudless till 7 A. M. Scatd. clouds afterwards.
17	133.6	1.02	S. & S. E.	Cloudy till 2 A. M. cloudless till 8 A. M. cloudy afterwards; also thundering, lightning & raining between 8 & 9 P. M.
18	129.0	..	S.	Cloudless till 5 A. M. Scatd. _i & ∩i till 5 P. M. cloudy afterwards; also slightly drizzling at 8 & at 11 P. M. during which constant flashes of lightning were visible.
19	135.4	..	S. E. & E. & S.	Scatd. clouds till 7 A. M. cloudless afterwards.

\i Cirri, _i Cirro strati, ∩i Cumuli, ∩_i Cumulo strati, __i Nimbi, —i Strati, \i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
20	135.0	..	S. & S. W.	Scatd. ⌐i till 7 A. M. cloudless afterwards.
21	136.4	..	S. & S. E.	Scatd. clouds.
22	*Sunday.*			
23	124.0	..	S.	Scatd. clouds; also drizzling between 6 & 7 P. M.
24	128.0	..	S. & S. E.	Scatd. clouds; also drizzling at 7 A. M.
25	130.0	..	S. & S. E. & S. W.	Cloudy.
26	133.0	..	S.	Scatd. clouds till 4 P. M. cloudless afterwards.
27	136.0	..	S.	Scatd. clouds till 7 A. M. cloudless afterwards.
28	138.0	..	S.	Cloudy till 10 A. M. cloudless afterwards.
29	*Sunday.*			
30	136.6	..	S.	Cloudy till 9 A. M. cloudless till 5 P. M. Scatd. clouds afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

MONTHLY RESULTS.

	Inches
Mean height of the Barometer for the month, ...	29.759
Max. height of the Barometer occurred at 11 P. M. on the 18th, ..	29.921
Min. height of the Barometer occurred at 4 P. M. on the 30th, ..	29.608
Extreme range of the Barometer during the month, ...	0.313
Mean of the daily Max. Pressures, ...	29.826
Ditto ditto Min. ditto, ...	29.684
Mean daily range of the Barometer during the month, ...	0.142

	o
Mean Dry Bulb Thermometer for the month, ...	84.9
Max. Temperature occurred at 2 P. M. on the 30th, ...	100.8
Min. Temperature occurred at 6 A. M. on the 18th, ...	72.2
Extreme range of the Temperature during the month, ...	28.6
Mean of the daily Max. Temperature, ...	94.2
Ditto ditto Min. ditto, ...	77.3
Mean daily range of the Temperature during the month, ..	16.9

	o
Mean Wet Bulb Thermometer for the month, ...	78.2
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..	6.7
Computed Mean Dew-point for the month, ...	74.8
Mean Dry Bulb Thermometer above computed Mean Dew-point, ..	10.1
	Inches
Mean Elastic force of Vapour for the month, ...	0.849

	Troy grains
Mean Weight of Vapour for the month, ...	9.07
Additional Weight of Vapour required for complete saturation, ..	3.42
Mean degree of humidity for the month, complete saturation being unity,	0.73

	Inches
Rained 8 days, Max. fall of rain during 24 hours, ...	1.02
Total amount of rain during the month, ...	2.47
Prevailing direction of the Wind, ...	S. & S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April, 1860.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
					No. of days.														
Midnight.			1				6		15										3
1			1		1		6		17	1									
2					1		7		17	1									
3					1		7		16										1
4					1		6		14										4
5					3		6		15		1								
6					4		5		15						1				
7					3		7	1	13		1				1				
8	1		2		1		2		15		3				1				
9	2				1		5		14		3								
10	2				1		3		17		1		1						
11	1				1		3		15		4				1				
Noon.			1		2		3		12		6				1				
1			1		2		2		15		4				1				
2			1		2		1		16		4				1				
3					3		1		17		3				1				
4					2		3		12		4		1		1				2
5					2		5		14		2		1		1				
6					1		5	1	15		2		1		1				
7					1		5		13		4	1	1				1		
8	1				1		5		14	1	3	1	1	1					
9	1		1	1	1		5		14	1	2								1
10			1		1		4		17		2								
11			1		3		2		17	1	2								